TRANSACTIONS

OF THE

FORTY-THIRD ANNUAL MEETING

OF THE

American Laryngological Association

HELD AT ATLANTIC CITY, N. J.,
MAY 30, 31 AND JUNE 1, 1921

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1921

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TRANSACTIONS OF THE FORTY-THIRD
ANNUAL CONGRESS

OF THE

AMERICAN LARYNGOLOGICAL ASSOCIATION

HELD AT

ATLANTIC CITY, N. J., MAY 30, 31, AND JUNE 1, 1921

REGISTRATION

The Forty-third Annual Congress of the American Laryngological Association was called to order Monday, May 30, 1921, at 10 A. M., by the president, Dr. H. P. Mosher, at the Hotel Chelsea, Atlantic City, N. J. The following Fellows enrolled during the session:

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DABNEY, VIRGINIUS
DEAN, LEE WALLACE
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EMERSON, FRANCIS P.
FAULKNER, E. ROSS
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GREENE, D. CROSBY, JR.
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HASTINGS, HILL
HURD, LEE MAIDMENT

Imperatori, Charles J.
Ingersoll, John M.
Jackson, Chevalier
Johnston, Samuel
Kernan, John Devereux
Lewis, Fielding Otis
Loeb, Hanau W.
Logan, James E.
Lynah, Henry L.
Lynch, Robert Clyde
Mackenty, John E.
Mayer, Emil
McCullagh, Samuel
McKimmie, Oscar A. M.
Mosher, Harris P.
Munger, Carl E.
Packard, Francis R.
Pierce, Norval H.
Randall, B. Alexander
Richards, George L.
Richardson, Charles W.
Roy, Dunbar
Sauer, William Emil
Shurly, Burt R.
Skillern, Ross H.
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Smith, Harmon
Swain, Henry L.
Watson, Arthur W.
Wilson, J. Gordon
Winslow, John R.
Wood, George B.

ADDRESS OF THE PRESIDENT

HARRIS P. MOSHER, M.D.

This venerable Association is assembled today for its forty-third annual meeting. The date of the foundation of the Association is a landmark. Its history is a proud one. It has no entangling alliances and it is splendid in its isolation. Its past is part of the warp and woof of laryngology. If the future is predicated by the past, and I believe it is, the future of this Association should be most bright.

I would have the members of the Association feel that I keenly appreciate the honor of being chosen its President. I thank the Fellows for the crowning honor of my career.

Far be it from me to make this presidential address a swan song. Yet the presidency of this society carries with it a feeling of finality. The occupant of the position becomes a bit introspective and inclined to sum up. He knows he has passed his most important professional milestone—the years automatically count themselves and pass in review—and the last milestone of all seems measurably nearer.

There are two subjects to which I desire to call your attention briefly, one a bit hackneyed, namely, the standardization of the education of the specialist, and the other the question why so few university-trained men are now entering the speciality of laryngology.

Allow me to discuss the second topic first. For two generations the better men in the graduating classes of the medical schools have chosen to practice surgery. Today, however, they elect medicine. Is it that surgery has not advanced? It would be most foolish to make such a statement. Is it because there are too many surgeons? I should answer this, "Yes," with reservations. The real reason, however, it seems to me, is that medicine has by its advances come nearer the basic problems underlying health

and disease than has surgery. The vistas which are opening up before medicine at the present time stagger the imagination when it tries to see into them. Take the single problem of immunity: what this means in terms of chemistry, in terms of the fundamentals of disease or in terms of the prevention and cure of disease has hardly been sensed as yet. While surgery has remained quietly at home piling up its quota of successful operations, medical men, suddenly imbued with the holy fire, have traveled the world over, sometimes alone, often in groups, to study diseases new and old. No country has been too remote, no plague too deadly to keep them away. They have seen the vision and have been guided by it. Their surgical brothers meanwhile have been busy mainly with repair jobs. Action and quick accomplishment, which used to be the prerogative of the surgeon, have become the prerogative of the medical man as well.

Leaving these generalities, let us come to our own specialty of laryngology. Why are the better-trained men not choosing this specialty in the same numbers as of old? First, the reason given above is in part the answer; second, laryngology has exhausted itself.

This specialty owes its birth to the invention of a single instrument. The instrument, which is simplicity itself, was one of those elemental conceptions of genius, complete at birth and epoch-making. That epoch has drawn to a close. Laryngology as laryngology in my opinion is over. Given the opportunities of general surgery or general medicine as they are known today, what young man would choose laryngology? You may say that I am tilting at a straw man, that laryngology now includes rhinology. Granted. But do straight laryngology and straight rhinology give the abundant opportunity that young men of today want? I do not think they do. It is only by frankly accepting as part of the specialty the subjects in medicine and surgery that border on laryngology that it can retain its vitality, that it can offer a full medical life and attract and win the better class of recruits. Just look round a bit. How many men have we in our specialty doing serious pathology? How many doing experimental physiology? How many adequately trained men working in immunity and anaphylaxis? They are very few. How often do we get a man in the

specialty who has a modern foundation either in comparative anatomy or embryology? Very seldom.

I think my thought is sufficiently clear without harping on it. Therefore, if I am in any measure right, what is to be done about the matter? Half the battle is to know the problem, and I think we know it. In my opinion we should encourage the men among us whose bent is primarily surgical to engage in as much of the allied surgery of the head and neck as their talents and training fit them to do. We should expect our members to keep up in general medicine. As specialists we should continually forage in every field of medical activity even if for the moment we cease to be specialists. We have an overabundance of manual dexterity. What we need is the farseeing, correlating mind. We need vision—without vision we perish.

This Association proposes to take in thirty associate members. Here is the golden opportunity. Go out into the highways and byways and find the right men and get them into the society while they are still producing. This Association should not live on the momentum of past achievement. The armchair is tempting all of us. Success—and we have all tasted success—first slips a cushion under the feet and then one under the head.

One of the results of the war was a revival of interest in postgraduate teaching and in the standard of attainment which a man must reach in order to be rated as a specialist. Much notoriety, as you know, was given to the figures obtained at Oglethorpe. The figures in otolaryngology were the first available and have been used as a dreadful example ever since. You know also that the war revived some languishing committees which for a number of years had struggled to an impasse with this question of the education of the specialist. We are in a position to see the scientific life of the specialist as a whole better than any other society. If this society is to live up to its opportunities and to its duties it must be interested in this subject. If this society collectively and individually is not interested in this matter the mantle will begin to slip from its shoulders. The subject is not a simple one. Its solution requires a nice balance between the rights of the individual to development along any line he chooses and the rights of society to the protection of trained and efficient service.

Many of us have been teaching all our medical lives. Most of us have worked out our courses independently. We are now asked to coördinate them and to carry out a plan which has certain definite requirements, that is, shall embrace the minimum requirement for practising the specialty of otolaryngology. You are all familiar with the proposed two-year plan. The combined committee of the various special societies, of which Doctor Wishart is chairman, has ably and fully worked out the details. We all agree that the plan is excellent, and we look about and marshal our forces to see how far and how soon we can carry it out. Here comes the rub, and it is the same old rub, men and money—men for teachers and money to make it possible for them to teach. The practice of medicine has always been for me quite a bit of a luxury. My father, my mother, my wife and incidentally the support derived from my practice have made it possible for me to devote a large part of my time to hospital and school work. I hesitate to say that some other men have not been as fortunate as I have been. But I am afraid that I must. Few of the younger men I see coming along can afford to follow in my footsteps should they in a moment of enthusiasm or aberration feel momentarily so inclined. I feel therefore that our postgraduate schools must be endowed. If any philanthropist wishes to help humanity in the quickest way possible let him endow postgraduate teaching in a few of our largest medical schools. Until that time comes we shall dream dreams, set up standards and gaze longingly toward the promised land, but we shall never set foot firmly on it.

Do not misunderstand me. I heartily approve of the standards you are hearing so much about today. It is most helpful to have them. The better students will follow them as far as their opportunities and purses allow.

The old six weeks' course which enabled not a few men of little surgical conscience to set up as specialists after they had taken such a course has gone. But watch out that it does not recur in some glorified form. Such courses can be made to pay, and to pay well. In this lurks the old danger. Lectures are easily assembled from text-books—they can be stretched over any period of time—but supervised clinical instruction for each student is a wholly different thing. The men who are teaching fundamental

subjects to undergraduates are earning their salaries three times over without asking them to lengthen their hours by teaching postgraduates for nothing.

As you all know, the American Medical Association proposes to adopt a plan for standardizing the training in the specialties. I am in full sympathy with it. I am especially interested, however, to see how the Association is to enforce its requirements. The approval of a standard by the Association will carry great weight. But approval alone seems to me a bit like a parent's blessing when a young man makes up his mind to get married. It is a nice thing to have, but the self-reliant often go ahead without it.

I feel that more is to be accomplished quickly in the matter of elevating the level of the training of the specialist by entrance examinations to the various special societies, because these can be made operative at once and can be made as restrictive as is deemed wise.

The great difficulty in any standard plan for the education of the otolaryngologist is the lack of special hospitals. Relatively few men can obtain clinical experience in them as house officers. Hospital authorities are chary about postgraduate students operating. Courses which carry with them the privilege of operating on hospital cases have to be conducted *sub rosa*. Therefore, in order to obtain adequate operating experience a candidate for a specialty must, become a part of the legal machinery of a clinic, either as an accredited voluntary assistant for a definite period or as a house officer.

At once the criticism will be made that it is more important to know when to operate than how to operate. In my opinion it is equally important to know how to operate and when to operate.

How far have we advanced in this discussion? Postgraduate instruction, in my opinion, must be endowed. The quickest and most practical method of raising the standard of the specialist is by admittance examinations to the special societies. A judicial and farseeing set of examiners can change the whole atmosphere of things in a few years. In the meantime each medical school and each hospital will have, as at present, to work along alone. The two-year requirement should be steadily held to as the goal aimed at. It will be gained bit by bit, always excepting, of course,

an institution like the Mayos', where all things are possible and Aladdin's lamp is at hand to supply every need.

Allow me to suggest that the school which first gets an endowed postgraduate department should look for a dean among the younger men. He should be a man in touch with the outside world. Harvard has just lost such a man. He has gone up higher in another school. It is a dangerous expedient to choose an emeritus professor, as has been done so often. He is liable to fall asleep on the job.

Speaking of postgraduate students, allow me to remark that the man who deals with them has to be wide awake. They know what they want and are out to get it. Often they are not polite in demanding it. Not infrequently they adopt the stand-and-deliver attitude of the highwayman. Just why should you stand and deliver? I do not believe in being a dog in the manger. I feel that having received I should also give. I attempt to discharge my medical civic duty by giving up practice one month each year in March and placing everything that I have, even my house and my home at times, at the disposal of postgraduate students. On the whole I am more than repaid for this. It helps me to keep up with the times. I meet new men and always learn something from them, and I learn wonderful things about parts of the country I have not been fortunate enough to see—California, for instance. I like to teach—that is for one month. I like getting up shows. I like to play the schoolmaster, stopping just short, of course, of anything like a league of nations. What I started to say was that although I like teaching I object to being held up for it at all times. If the pushing type of student had his way I might soon have no more privacy than Irvin Cobb's famous goldfish.

Allow me to digress from the main subject a moment more and still speak of the personal side of teaching. How many of the men here who are teaching or who head special departments in hospitals have an understudy? You may think you have, but are you consciously training one? Is your department at the mercy of one man? Is the department safe no matter who may drop out? The flippant answer to this question is that any man's place can be filled. It cannot. So I repeat, how many of you men here have an understudy? How many of you have someone

coming along who will keep alive the best things that you have done, who will use your specimens and charts and add to them, and be a bit tender about them, now and then, because they were yours? I hope, I think that I have.

I think so because of Friday night. Friday night means in my household and among my friends my evening at the medical school. For years, my vacation month of July excepted, I have regularly been at the school on this night. First I deserted my father and mother. Now I regularly desert my wife. I have always met with consent and encouragement in spite of the loneliness which has come to all of us at times. On these nights the house officers come up from the hospital in turn, and certain of the younger men in the specialty come, and have been coming for years. Often as many as seven or eight men assemble for the evening. Physicians from out of town occasionally drop in, for it is known that I keep open house on this night.

The first part of the evening the men help me in whatever work I have on hand, preparing specimens or helping in the various stages of making casts, melting wax and injecting bodies, mixing plaster and clay for the molds, pouring the molds and finally chipping the mold away to release the finished cast. They mop the floors and clean and put away the instruments. We are often a very dirty but very happy lot during plaster time. No piece of work has yet proved to be too menial for them to do unasked. Once or twice a year when a show is on—the American Medical Association is coming this year, the Triological and the Laryngological were with us last year—we spend our Friday evenings for a while getting ready for it. On most of the evenings, however, after an hour helping me, the men break up and work for themselves. I give them what specimens can be spared and suggest from time to time lines of work. While we are working in common, for I work with them, a rattling fire of banter mixed with medical gossip is going on. Current hospital cases come up for pointed discussion. When March comes these same young men—there were six this year—turn to and act as assistants in my course. Each gives up two office afternoons and four evenings a week for a month. One of these men repeats my anatomy course in the summer. I look to him to be my understudy. I could pick

another one from this group if necessary. How long we can hold together I do not know. Friday night has been one of the most useful and delightful parts of my medical life. When the change comes, as come it must in time, the rhythm of my heart will change too.

I mention Friday night, first, because I am proud of holding these men about me for so many years; second, because I feel that my best contribution to medical teaching has been given on these nights and during my course in March. If I seem a bit pessimistic about the immediate attainment of utopia by the standardization of the education of the specialist through the two-year course I wish to record that I am doing what I hope is my bit for the cause, and I intend to continue to do it for some time yet.

We have lately established in Boston a house officership in otolaryngology. The service requires twenty months, twelve being spent at the Massachusetts Charitable Eye and Ear Infirmary and eight months in the throat department of the Massachusetts General Hospital. Most of the men who now hold the position have had a general surgical service and have taken courses at the medical school in the anatomy of the nose and throat and of the temporal bone. These house officers are expected to come in turn to the medical school on Friday night. As far as material permits they review the routine sinus operations on the cadaver. They make casts of the accessory sinuses, determine their capacity and measure them. I attempt to give the men a wholesome respect for the ethmoidal labyrinth, so that in their house-officer operations they will approach the ethmoidal operation with less nonchalance. When this routine work is completed they are encouraged to take some nose and throat subject and work it up from the books which are provided or from prepared specimens. During the four months that the throat house officer is senior he works one afternoon a week with Doctor Greene at the Huntington Hospital in the radium treatment of cancer cases, and his other afternoons free from the hospital he spends at a course in embryology which the department of anatomy kindly gives in order to help along the cause. There is not as much systematic instruction day by day at the hospital as Dean gives his house officers, but his is the ideal which we have before us.

Shambaugh made the suggestive remark that the best method of teaching medicine ever devised was the old plan of preceptor and student. I do not quite agree that this is best as far as undergraduate medical education is concerned, because no physician could give his apprentice the advantages of the modern medical school laboratories. But for the graduate student the plan appeals to me. A man holding a hospital position—this also is Shambaugh's suggestion—could take one or two men a year and be responsible for them. They would act as voluntary assistants in the hospital where he is on service and could do what school work there are facilities for. Let Shambaugh take two, Coakley two, Dean two, Beck two, Pierce two and so on. Such men are the yeasts and ferments of laryngology in this country today.

The above-mentioned house-officership is the best we have been able to accomplish so far in Boston for the education of the specialist. It takes care of but a few men. The March and April courses in the anatomy of the nose and throat and of the temporal bone take more men but do not carry them so far. If now we were to take two men as volunteer assistants on the old preceptor plan and keep them a year, hoping they would become house-officers somewhere at the end of this time, I think this is all we can at the present promise to do.

It is fatal in teaching to promise more than you can fulfil. Courses that appear in the catalogue and are given at the convenience of the instructor or only half-given, leave a bad taste in the mouth of the administration and of the student. Such courses in laryngology have been cut out at Harvard. We are down to bedrock and intend to stay there and to change but slowly. This is not said boastfully. We have been all through the other plan. Anyone who is willing to give the time, preferably a year at least, is welcome to the limit of our accommodations. The unsuccessful general practitioner or the ambitious general practitioner, for there are these two types who wish a little knowledge of the specialty, are not welcome.

I recognize the value of ideals and standards. Often, however, they cannot be realized at once. In this matter of the training of the specialist I personally cannot put the two-year plan into effect. My ideas for meeting the situation as it exists today are

as follows: Each teacher giving an intensive course should continue to do so. He should limit the number of students and should select them carefully. The two years' course should be approached as far as possible. It would help the student to select if four or five of the Class A medical schools would publish side by side a frank statement of what they can offer. The attempt should be made to have some sort of a sequence between the courses in the different schools so that the student could take courses in more than one institution. At the present time certain students on their own initiative are carrying out such a plan in part. The quickest method of raising the standard of the specialist is to require an examination for entrance to the special societies.

The question of the adequate training of the specialist merges naturally into the larger one of specialism itself. I am not going to take up this threadbare subject further than to remark that renewed mutterings are heard on the horizon about the increasing number of specialists, their alleged rapacity, etc., the time necessary to become a specialist and the further time that will be required if the present movement to standardize the education of the specialist is successful. It does not worry me, however, that it takes some time to become a competent specialist. Why should it not take time and money to acquire extra and special knowledge? A special product in any form of human activity is purchased only on such terms.

It has been suggested that the medical student should anticipate special studies in his fourth year. This might do for the man who is to practice a laboratory specialty, but not for one who chooses a clinical subject. He should start with the broadest perspective possible, because from the hour he begins to practice the shades of the prison house of routine begin to close about him. Still speaking of specialism as a whole, I should like to mention two more points, and then I have finished. We are told specialists are like the labor unions in that they force the public to employ four men to do one man's job, and there is some truth in the charge. We are warned, further, that if we go too far state medicine will step in and protect the general practitioner and even things up. Frankly, I think the general practitioner is hard put to it. Group medicine seems to be about his last straw. If he becomes extinct

the human element will largely drop out of medicine. But Nature will not be denied for long. Some new medical fad which openly or covertly supplies the longed-for element will arise to vex and perhaps smite us. Somehow I think there will be a readjustment in this matter of the general practitioner, but when and how it will come I do not know. When I gave up the practice of general medicine something very definite went out of my life, namely, the personal touch with the patient. I am more and more an operating machine, and as the change has gradually come about I have come to understand what is meant by the phrase, "The laboratory eye is glassy and the operating hand is cold!"

CARDIOSPASM

HARRIS P. MOSHER, M.D.

Last year I reported the cadaver findings in some thirty casts of the injected esophagus and stomach of adults and sixty injected and dissected babies. I have recently supplemented these findings by certain clinical observations. A somewhat definite picture seems to be forming about happenings at the lower end of the esophagus. Whether it is a picture drawn by fancy or from facts the future will have to settle.

The basic fact of my last year's paper was that the liver is chiefly responsible for the shape of the lower end of the esophagus. The lower end of the esophagus is usually cone-shaped, that is, narrowed, or trumpet-shaped, that is wide and flaring, according to the closeness of the investing liver. The lower end of the esophagus has the liver on the right, in front, and in many cases a thin tongue of liver hooks around its left edge like a sickle. Behind the esophagus is the descending aorta, which separates it from the vertebral column. The subdiaphragmatic part of the esophagus runs, therefore, in a tunnel of liver.

During the past nine months in studying the *x*-ray plates of my cases, in examining cases before operation with the fluoroscope and in checking up the fluoroscopic and plate findings with those obtained through the esophagoscope the importance of the liver tunnel has steadily grown upon me. I have long been familiar with the fact that plates of the lower end of the esophagus often show it ending in a nipple-like point. Between this and the fundus of the stomach there is a gap. This varies in length, but may measure an inch or even an inch and a half. Finally, I realized that this gap was the closed liver tunnel. This observation has proved to be a fundamental one and has enabled me to connect up my anatomical and clinical findings.

It is this liver tunnel which I wish to speak of today.

The Liver Tunnel Seen Through the Fluoroscope. The liver tunnel as studied on the cadaver varies in length in different subjects. Its other dimensions also are subject to wide variations, and these variations are found at birth. The tunnel can be demonstrated by the *x*-ray plate or through the fluoroscope. In watching a patient with a normal esophagus swallow, the esophagus is seen to come to a point momentarily at the upper border of the liver. Then after a delay of a second or two the liver tunnel opens up and the bismuth milk streams into the stomach.

I demonstrated in my last paper that the upper edge of the liver often makes a crease in the front wall of the esophagus and that this crease is present at birth. The left crus makes a crease in the posterior wall of the esophagus and a marked notch in its left edge, so that there is often a ballooning of the extreme lower end of the esophagus just above the notch made by the left crus. The stage is set for a dilatation of the esophagus at this point. Above the crease in the front wall of the esophagus made by the upper edge of the liver a spindle-shaped dilatation of the esophagus is common. This also is frequent even at birth.

Experiments on the cadaver show that the crescentic mound which is often seen through the esophagoscope in the right half of the field as the liver is approached is made by the upper rim of the liver. I asked Doctor Golden, of the *x*-ray department of the Massachusetts General Hospital, to prove for me that the upper border of the liver exerts appreciable pressure on the front surface of the esophagus. I wanted, if possible, to duplicate the cadaver findings. The result of our combined observations is that in a majority of normal cases there is an appreciable delay of the bismuth milk at the upper border of the liver when a patient swallows. Doctor Golden made the further observation that when the diaphragm is lowered the bismuth which is held back momentarily by the liver edge shoots at once into the stomach. Putting the patient in a position which causes the liver to fall away from the esophagus and so relieving the esophagus of liver pressure also seems to make the fluid pass into the stomach more easily. This is probably one reason why we automatically sit up to drink.

Cadaver Experiments. Pulling the diaphragm down by grasping and pulling on the left lobe of the liver tends to open the esophagus. Grasping the diaphragm near the hiatus and pulling downward also tends to open the esophagus. If the left edge of the liver does not actually surround the esophagus, but simply lies on its front face, backward pressure in such cases, cadaver observations show, causes an oblique line on the front face of the esophagus, the line corresponding with the upper edge of the liver, and the backward pressure of the liver tends to close the esophagus, the point of actual closure being on the left and below.

The Funnel of the Diaphragm. As the diaphragm dips down to form the hiatus or the esophageal opening it forms a funnel. For an inch and a half above the hiatus the front and sides of the funnel are attached to the esophagus by connective tissue. Between the esophagus and the aorta behind there is the same connective tissue, but the esophagus is less firmly bound down behind than in front and on the sides.

Annular Stricture Found in the Cadaver. I have found in the cadaver four specimens of annular stricture of the lower part of the esophagus. Each one caps a circumscribed dilatation, which is bounded below by the constriction caused by the left crus. Each stricture is on a level with the upper edge of the left lobe of the liver. One specimen was dissected to show the nature of the stricture, and it was found to be cicatricial. The lower part of the esophagus seems, therefore, to be caught between the liver edge above and the left crus below.

The Physiological Movements of the Diaphragm. The upward excursion of the diaphragm is caused by the relaxation of its muscular parts, by the rise of the intrathoracic contents which are attached to the diaphragm, namely, the lower lobes of the lungs, and the heart and its surrounding pericardium, and by the upward surge of the abdominal contents. The falling of the diaphragm is caused by the contraction of its muscles aided by the weight of the liver, which is attached to its under surface. Were the liver not supported by the viscera below it, and were these not held in place by taut abdominal muscles, the diaphragm could never alone hold up the liver and act against its seven-pound weight.

The diaphragm contracts sixteen to eighteen times a minute, and waves of peristalsis run down the esophagus at frequent intervals during eating and at irregular intervals between meals in order to carry away the saliva. Nowhere else in the intestinal tract does a piece of gut—the esophagus is a piece of gut the same as the intestine itself—pass through an independent and regularly contracting opening as the esophagus does in passing through the diaphragm. For this mechanism to act smoothly there must be some correlation or rhythm between the peristaltic movements of the esophagus and the relaxations and contractions of the diaphragm. Many patients with cardiospasm are very excitable and nervous. Some of these patients, as the fluoroscope shows, can constrict and close the esophagus by forcing the diaphragm downward. As children many of us had a panic when we attempted to swallow a pill, and could not get it down until we took some water, which we knew went readily, and so cured the panic. These nervous patients, the victims of cardiospasm, may have first had their attention called or rather focussed on the esophagus by some trivial mishap in swallowing, like swallowing the wrong way, swallowing a small bone or, what is equally uncomfortable, swallowing a bolus of air. In this way the unconscious rhythm between the peristalsis of the esophagus and the diaphragm became upset and a vicious circle started. As a result the bolus of food would meet at times a closed diaphragm and the natural bagging of the esophagus which exists just above the right and left crus would be accentuated.

When a large esophagoscope is passed down the esophagus of a cadaver a sizable pouch is found to the left above the left crus and a smaller pouch on the right opposite the right crus. If the esophagus is not distended by inflation with air the walls of the esophagus invaginate upward into the tube and narrow its lumen to a slit or to a round central opening. A bolus of food that arrived at the hiatus when it happened to be closed could do the same thing.

Falling of the Diaphragm in Cardiospasm. In three cases of cardiospasm of which I have good records the diaphragm was moderately lowered in one and markedly lowered in the other two. Doctor Merrill, who made these observations for me, and Doctor

Holmes, both of the Massachusetts General Hospital *X*-ray Department, report that in the other cases of cardiospasm which they have seen the diaphragm is usually lowered. In these three cases the downward excursion was only a quarter of an inch, whereas the upward excursion was normal, that is, from an inch to an inch and a half. In two of these three cases forcible lowering of the diaphragm would constrict the esophagus and stop the flow of the barium milk. With the upward excursion of the diaphragm the flow through the esophagus into the stomach would be resumed. In quiet breathing there was no interruption of the flow.

It will be observed that this finding is just the reverse of the finding in the healthy esophagus. In the majority of the normal cases investigated so far there is a momentary narrowing of the esophagus at the superior edge of the liver when the diaphragm is up and the barium milk hesitates there a moment. When the diaphragm goes down and carries the liver with it the esophagus opens and the barium milk shoots into the stomach. This corresponds with the cadaver finding that when the liver is pulled downward the esophagus tends to open. When the liver is up it exerts more pressure on the esophagus.

The Liver Tunnel and Cardiospasm. In reviewing my cases of cardiospasm I find there was a stricture in the majority of them, and this stricture was by preference at the beginning of the liver tunnel at the upper edge of the liver. It has long seemed to me that it was asking too much of the spasm to make it the sole cause of the extensive deformity which is present in long-standing cases of cardiospasm. To my mind it would be more rational to invoke some mechanical explanation either as the sole cause or at least as the continuing cause once the condition is initiated. The esophagus is a somewhat specialized portion of the general alimentary tract, but like the intestines responds to irritation by contraction and spasm. I do not wish to do violence to physiology to the extent of ruling out spasm. I might be willing to allow it to start the vicious circle which ends in cardiospasm. It is an annoying symptom of the disease in certain cases. It is surely capable of making bad matters worse. But why should it always occur at this one point in the esophagus? Why do patients with cardio-

spasm seldom have spasm or cramps anywhere else? I have met with but one patient who did. She was a young woman, in the twenties, who showed what the neurologists called a condition of tetany. Her nervous excitability remained that of a child. The threshold of all her nervous stimuli was very short. She was accustomed to have cramps in various parts of the body as well as in the esophagus. I have watched for a duplicate of this case but have not found it. In my notes on this case there is the following record: She is one of the cases which I have been able to study most thoroughly, owing to her willing coöperation:

NOTE.—May 5, 1917. M. G. H. (Miss R.) Fluoroscopic examination by Dr. Merrill one week after dilatation of stricture under ether.

For the past week the patient has eaten everything. With every meal there have been one or two spasms at the beginning of the meal. After these pass away there is no further trouble. By spasm the patient means halting of food. She is conscious that the food halts and can tell the moment it begins to enter the stomach. When the patient has pain it is referred to the center of the sternum. She had pain but once, and then only slightly, last week.

On swallowing the barium milk it was seen to collect and to dilate the esophagus in the usual nipple-like manner. After two or three minutes, and from this time on to the end of the examination, some ten minutes, the milk flowed steadily on in a stream fully twice the size of the initial stream. This may have been due to the giving way of the spasm or to the unfolding of the esophagus by the first food that passed down.

In quiet breathing inspiration and expiration had no influence on the rate of flow of the barium through the esophagus. On lowering the diaphragm by forced inspiration the tapering point of the esophagus appeared as if suddenly cut off; an inch and a half suddenly dropped away and the closed end of the esophagus moved upward an inch and appeared as a blunt point. On forced expiration the esophagus came down an inch and lengthened out again into its former pointed form. Forced contraction of the crura, therefore, will close the esophagus and forced relaxation will open it.

The hiatus is an elliptical ring which surrounds the esophagus obliquely, crossing from left to right and from above downward. The actual hole in the diaphragm through which the esophagus passes is

tendinous. The right crus is attached to the front of the esophagus and the left crus is attached behind the esophagus to the posterior part of the margin of the hiatus. The hiatus being a tendinous hole cannot close, but the oblique slit made by the two inner edges of the right and left crura closes from below upward when the diaphragm contracts and lowers its position.

My present explanation of the fluoroscope findings in this case, putting all the findings—fluoroscopic, *x*-ray plate and operative together—is that when the diaphragm is forcibly contracted the deformed liver cone is obliterated from below upward by the firm closure of the lips of the crura and the crowding backward of the liver. The upper edge of the liver momentarily shuts off the esophagus as if a string were tied round it. The closure of the liver tunnel explains the sudden disappearance of the lower inch of the esophagus and the sudden constriction of the esophagus above it.

Clinical Cases of Cardiospasm due to Stricture in the Liver Tunnel. The more cases of cardiospasm I see the more I find an element of stricture in them. I still call these cases cardiospasm because the obstruction occurs at the lower end of the esophagus; the esophagus ends in the characteristic nipple-like point, and swallowing of cold fluids increases the difficulty in swallowing, whereas swallowing of warm drinks makes the passage of food through the esophagus easier. The stricture element found in my cases varied from a slight crescentic fold showing in the right quadrant of the esophagoscope in the region of the hiatus to a full annular stricture with a central opening. In the cases which showed the crescentic fold, steady pressure with the end of the esophagoscope usually resulted in the tube slipping by into normal esophagus below and through this into the stomach. The withdrawal of the tube generally showed a vertical slit in the mucous membrane of the esophagus. I have held these cases to be analogous to partial webs at the mouth of the esophagus. These may be divulsed in the same way by the introduction of the tube.

I have records of three cases in which there was a full stricture with a central opening. This stricture was at the hiatus or rather at the upper edge of the liver. On divulsing it with the mechanical

dilator a crescentic mounding was seen below it in the right field. Steady pressure with the tube caused it to pass this and enter the subdiaphragmatic esophagus and then continue on into the stomach. This mound I now believe to be the upper edge of the liver.

A Case in which the Whole Liver Tunnel was Narrowed. The following case shows a narrowing of the whole length of the liver tunnel. The esophagoscope demonstrated three partial strictures, one succeeding the other at a lower depth, and all just above the liver. At the edge of the liver there was a small central opening through which the tube could not be made to pass. The reason for this is seen at once by looking at the plate. This shows a narrow and long liver tunnel. Judging from my cases we can have strictures at the upper or lower end of the liver tunnel or anywhere in its course, or we can have a narrowed liver tunnel or a stiffened tunnel through which the food passes slowly. In any of these cases, as long as the esophagus retains its peristaltic action, there may be an element of spasm from time to time which reënforces the obstruction caused by the stricture or by the rigid or narrowed liver tunnel. My observations would seem to show, however, that spasm is a minor element in these cases.

My observations show that we have in these cases at the upper edge of the liver partial or full strictures which are readily divulsed, and when the edge of the liver which lies below is pushed out of the way the tube meets no further resistance in passing the subdiaphragmatic esophagus and in finally entering the stomach. In other cases the central stricture is a stricture of the whole subdiaphragmatic esophagus; in other words, the liver tunnel is narrowed for its whole length.

Theory of the Cause of the Strictures of the Liver Tunnel. What causes these partial and full strictures to form at the upper edge of the liver tunnel? I found one such stricture in the cadaver in which there was a healed tuberculous process of the lumbar vertebra opposite the upper edge of the liver. The fact that in normal cases the upper edge of the liver causes a momentary delay in swallowing in the majority of cases, and that the knife-like edge of the liver often markedly indents the front face of

the esophagus, makes this part of the esophagus vulnerable and subject to trauma by food.

I feel that narrowing of the liver tunnel due to an inflammatory involvement of the lesser omentum will be found in the future to play a large part if not the greatest part in producing these cases of cardiospasm. Where does the inflammation originate? It can start in any part of the peritoneal cavity. Below the diaphragm the peritoneum runs from the lesser curvature of the stomach to the liver, making the lesser omentum and bounding the foramen of Winslow. The subdiaphragmatic esophagus is bathed in this peritoneal tissue. It shares in the inflammations, acute and chronic, of the rest of the peritoneal tissue of the abdominal cavity. When the lesser omentum becomes involved the liver tunnel becomes less flexible. It is well known that disease of the gall-bladder, cancer of the lesser curvature of the stomach, and if cancer probably also ulcer and disease of the appendix, are associated with cardiospasm.

In one of my cases of cardiospasm in which there was a web-like annular stricture the patient when an infant swallowed a two-cent piece. In another in which also there was an annular stricture the patient gave a history of an attack of general peritonitis twenty years before. The origin of this was never discovered. The first case was probably traumatic and the second inflammatory.

Cases of Involvement of the Esophagus by Extension of Neighboring Disease. After one period of dissection six bodies came to me and the esophagus and stomach were injected with wax in the usual manner. On dissection three of the bodies proved to be tuberculous.

In the first body tubercular glands encircled the esophagus from the clavicle downward. The glands were especially marked below the bifurcation. The esophagus was so narrowed by the surrounding glands that the introduction of the large esophagoscope was impossible.

In the second body there was a tubercular infiltration on the inner surface of the middle and lower lobes of the right lung. The lung was glued to the pericardium and the pericardium to the esophagus. Adhesions ran from the pericardium to the esoph-

agus. Opposite one of these there was a slight constriction of the esophagus.

In the third there was a tubercular abscess in the lower lobe of the left lung. There were two tuberculous nodules on the spine, one in the cervical region and one in the lumbar. Both nodules were healed. Opposite the lower one there was an annular stricture at the level of the upper edge of the liver. (See above.)

These cases show the influence which tuberculosis of the lungs and of the spine can exert on the esophagus. I wish to call special attention to the fact that the annular stricture had a healed tubercular ulcer behind it and that it was placed in front of the upper edge of the liver. My belief is that the pounding of the upper edge of the liver was the determining factor in the ulceration of the esophagus which resulted in the stricture. There was no such stricture in the cervical region opposite the site of the healed ulcer located there. Above the diaphragm, in the region of the cone of the diaphragm, disease of the lungs or of the spine, therefore, can involve the esophagus and result in a stricture.

The Level of the Point of Occlusion in Cases of Cardiospasm. Where is the level of the nipple in which the esophagus ends in these cases of cardiospasm? In the two cadavers examined in connection with this point it was found that the cardiac opening of the stomach was opposite the tip of the ensiform cartilage. With the falling of the diaphragm the liver, of course, falls with it and the level of the hiatus is correspondingly lowered. For instance, in one case in which the esophagoscope demonstrated a stricture at the upper border of the liver the nipple of the esophagus was two inches below the tip of the ensiform cartilage and one inch to the left of the median line. The nipple was not at the cardia because the fluoroscope showed the fundus to be an inch away and separated by a white line which became dark as the bismuth passed between the nipple and the cardia of the stomach. The esophagoscope showed a partial stricture at the upper border of the liver or at the entrance to the liver cone. The fluoroscopic picture and the plate showed this partial stricture of the right half of the esophagus, below this the liver tunnel filled with bismuth, and then another stricture, which was at the point of the nipple. This coincided with the lower end of the liver cone. The point of

the nipple may therefore be at the top or the bottom of the liver cone or anywhere in between. In another case in which the diaphragm was low the nipple was in the middle line and one inch below the tip of the ensiform.

To sum up I have proved to my satisfaction that many of these so-called cases of cardiospasm are mainly cases of stricture. The part played by falling of the diaphragm has not been as yet ruled out. In my cases, at least, spasm played but a minor role.

TONSILLECTOMIES IN ADULTS FOR RHEUMATISM, WITH A CRITICAL REVIEW OF RESULTS

HILL HASTINGS, M.D.

Much that has been written of the tonsil operation deals with the surgical technic. Comparatively little has appeared in laryngological literature dealing with clinical problems or the results from the patient's standpoint.

The clinical problems are, of course, not strictly within the province of the laryngologist, but the operator cannot and should not, it seems to me, lay aside his share of responsibility for the results. The overzealousness of a large part of the medical profession and the general public, too, in urging tonsillectomies, is tending at this time to bring disrepute on the operation. The duty of safeguarding it lies, to a large extent, with the laryngologist. The past history of operations in other surgical fields certainly impresses one with the need of greater care in selection of cases for tonsillectomy lest the operation be greatly abused. These considerations prompted the writer to review his own tonsillectomies. A review of this kind is admittedly imperfect and far from satisfactory, but it may prove of value as a small contribution to the larger and better mass of evidence that is gradually accumulating on the tonsil question.

Limitations. 1. All adult cases in which tonsillectomies were done solely for ear, nose and throat diseased conditions are excluded, such as cases of quinsy, accessory sinus disease, middle-ear disease, recurrent laryngitis and bronchitis, etc. Cardiovascular cases are excluded.

2. Cases that date back over six years are excluded for two reasons: (1) It has been only the past six years that the writer has been impressed with the necessity of using greater care in the selection of these operative cases, by doing group-study with the

combination of careful examinations by competent internists, orthopedists and dentists. (2) Cases that date back over a long period of time are excluded because so many other factors may enter into the question of improvement or deterioration in the health of these adult invalids.

3. All cases are excluded that are of shorter duration of observation than four months, for it is a common experience to see marked temporary improvement follow a tonsillectomy, say for a few weeks, with recurrence of the symptoms. This seems especially true of rheumatic cases. Such cases are often lost sight of after the tonsil wounds are healed and the subsequent results are liable to be unknown. It has been suggested that the enforced rest of the intestinal tract after a tonsillectomy has much to do with this temporary improvement. It has also been suggested that the effect of a general anesthetic on the muscle spasm, more or less constant in some rheumatic cases, is decidedly beneficial for a short period of time.

These limitations left 130 cases out of 477 adult tonsillectomies. In the 130 cases patients suffered from and sought operation because of rheumatism—most of them with impairment of general health; some, however, with no impairment of health. It seemed best to the writer to limit this report to this group of rheumatic cases because the indications for operation were evident on account of the pain and stiffness common to all cases of this group. One could depend more upon the accuracy of the subsequent results as determined by examination of the patients and checked up by questionnaires which were answered by all except 26 of the patients. No operation was done in any case of definite rheumatoid arthritis. No tonsillectomy was done during an acute attack of rheumatism with fever. The selection was made from patients who were not entirely bedridden; most of them were confined to bed during an acute exacerbation. Many suffered pain and stiffness only periodically. Some were more severe, requiring the use of crutches or rest in bed or some immobilizing apparatus; a few had had joint operations.

It is noteworthy that the shoulder-joint was affected more frequently than any other joint. Owing to the anatomical construction of the shoulder-joint it is probable that it is more subject to

injury from strains than other joints. It is believed that injury to a joint is frequently a forerunner of the localization of infection in that joint. The orthopedic and *x*-ray examinations frequently were negative, so far as making out definite bony or cartilaginous changes, in many patients even though they were chronic sufferers from pain and stiffness.

TABLE I

Age.	Cases.
19 to 30	20
30 to 40	50
40 to 50	38
50 to 60	18
60 to 65	4
Total	130

Eighty-eight of these cases were between the ages of thirty and fifty years.

TABLE II

Duration of rheumatism.	Cases.
One to six months	26
Sixth months to two years	38
Over two years	48
Indefinite time or not stated	18
Total	130

TABLE III

Parts affected.	Cases.
Shoulder	51
Arms	24
Hands	43
Elbow	5
Neck	9
Back	11
Hip	11
Leg	14
Knees	37
Feet	17
Ankle	14
Total	236

TABLE IV. CHARACTER OF RHEUMATISM WITH RESULTS OF TONSILLECTOMY

		Cases.	Improved.	Much improved.	Cured.	Not improved.	Unknown results.
Chronic arthritis	Mild	69	13	7	22	12	15
	Moderate	28	6	4	11	5	2
	Severe	4	0	0	0	4	0
Acute arthritis		3	0	1	2	0	0
Neuritis		6	1	0	0	2	3
Myalgia		20	3	2	5	1	9
Total		130	23	14	40	24	29

Of the severe and moderately severe cases many showed bony or cartilaginous changes. In these cases where secondary foci were chronically established, results were not only more slowly obtained, if obtained at all, but complete cure was rare. It was the opinion from group-study of mild and moderately severe arthritic cases that the joint condition was a chronic infection of the synovial membrane or of the capsule of the joint. The *x*-ray examination was negative in some cases even though effusion existed.

TABLE V

Throat history.	Cases.
Attacks of tonsillitis	54
Quinsy	9
Soreness	23
No tonsil complaint	46
Total	132

In the 46 cases in which there was no history of tonsillitis or even soreness it is, of couse, more than probable that in early life there had been definite attacks of tonsillitis. It is likely that a chronic infection dates back to a definite acute attack, the tonsils being streptococci carriers from that time on. How early in life a chronic infection begins is a problem in itself. The writer some time ago, in examining histologically some apparently normal tonsils in very young children, searching for signs of tuberculosis, was surprised to find streaks of chronic inflammation with well-defined fibrosis here and there in many sections of the tonsil tissue. Some of these children had no history indicative of a chronic

tonsil infection, but were operated on solely because of hypertrophied tonsil and adenoid.

TABLE VI

	Cases.
Abscessed teeth removed before tonsillectomy	26
Colectomy	1
Previous incomplete tonsil operations	12
Total	39

TABLE VII. SUBSEQUENT HISTORY

		Cases.		
Rheumatism	Improved	25	39.5	per cent.
	Much improved	15		
Rheumatism	Cured	40	39.5	"
	Not improved	24	21.0	"
Unknown results		26		
Total		130		

The subsequent results are based on personal examination of the patients by the writer, by the internists or by the orthopedist and checked up by questionnaires received from all of the 130 cases except 26 who could not be located. 39.5 per cent were improved or much improved; 39.5 per cent were cured; 21 per cent were not improved. Some of them gradually became worse, some of them remained stationary. In this whole series of tonsillectomies there were no hopelessly chronic cases operated and it would seem that the percentage of "not improved," *i. e.*, 21 per cent, should not have been so high; nevertheless, one feels that many of the cases that were marked "improved" might have become hopelessly chronic but for the tonsil surgery.

A review of the cases of rheumatism marked "cured" is worth while. Of the 40 cases in which apparent cure resulted 22 were diagnosed "chronic arthritis, mild," 11 were diagnosed "chronic arthritis, moderately severe," 2 were acute arthritis cases and 5 were "myalgia." A general survey of these cases showed that most of these patients had suffered for years, but not continuously, with pain and stiffness in one or several joints, at times acute and temporarily crippling. A few were crippled for months before operation. Orthopedic measures of various kinds had been tried. A few of them gave a history of symptoms of tonsil trouble; some no history of throat trouble. In 7 cases the history showed

an acute tonsillitis as a forerunner of the rheumatism. In other cases an accumulation in a tonsil crypt caused rheumatic symptoms. One such case bears reporting in detail:

H. A. S., male, aged thirty-two years, was seen first in 1909 on account of sore-throat and a cold in the head. His tonsils were partly removed when a child. Had attacks of sore-throat without fever or disabling symptoms three or four times a year. Antrum suppuration followed a recent cold. Examination showed a large red mass of tonsil tissue on the left side and a small mass on the right side. Advised tonsillectomy. Patient returned in 1910, 1911, 1913, 1914, 1915 on account of sore-throat. At such times a large crypt in the left tonsil was always found full of foul-smelling material and the tonsil tissue acutely inflamed. No quinsy, no fever. In April, 1915, the patient remarked that aching during these attacks had become more pronounced and that his wrist would become so tender for a day or two that he could not grasp another's hand; and that after cleaning out the crypts with the use of silver as a gargle, etc., the wrist tenderness would rapidly disappear. His words were, "I will be all right tomorrow." Six months later he submitted to a tonsillectomy. Five years later he reported that he had never had a return of the rheumatism; he had been absolutely relieved.

This case is reported not because of its rarity, but because it serves to bring up some points regarding the relations of a chronic tonsillar crypt infection to rheumatism.

It is the writer's observation that many adult patients who are cured or improved by tonsillectomy are of this type. It happened in this particular case that there was a direct connection noticed between the tonsil crypt inflammation and the rheumatism. In most cases no such connection is in evidence, yet the rapid and complete cure by tonsillectomy in such cases would lead one to believe there is in some part of the tonsil a similar diseased condition. A culture in this particular case showed Streptococcus viridans and staphylococci. The question arises, What is the pathological explanation of these rheumatic signs and symptoms that are so evanescent, lasting a day or two, only to recur and finally to disappear altogether after removal of the tonsils? Surely there can be no secondary foci of bacteria in the joints as in the persistent chronic infectious arthritic cases.

In a discussion on this question the writer's attention was called to an explanation (by an internist who has not, I understand, published his viewpoint) that seems reasonable. This explanation is that at some time bacteria from the diseased tonsil tissue did reach the joint in question and caused a reaction in the tissues of the joint, likely the capsule, with the development of a sensitization of the joint. The bacteria in the joint lost their virulence and finally disintegrated. Subsequently during an acute exacerbation of the old chronic tonsil focus there occurs an absorption of toxin, without bacteria entering the blood stream, which produces a reaction in the joint that formerly was injured by bacterial localization. Pain and possibly some temporary swelling of the joint or the capsule occur and an acute rheumatic condition is in evidence, without fever and without permanency. It is a common experience to see such rheumatic symptoms rapidly disappear. Whether these frequently recurring rheumatic symptoms are caused by anaphylactic reactions, or, on the contrary, by direct and frequent reinfections of the joint by bacteria, is, of course, not susceptible of proof.

TABLE VIII

Operations after tonsillectomy.	Cases.
Abscessed teeth removed, with improvement	8
Abscessed teeth removed, without improvement	13
Colectomy with improvement	2
Appendectomy with improvement	2
Cholecystectomy with improvement	1
Nephrectomy with improvement	1
Tonsil stump with improvement	1
General health (questionnaire answers)	
Improved	48
Much improved	30
Not changed	23
Unknown	29

In one case there was no improvement following tonsillectomy. On the contrary, some six or eight months afterward the patient developed an acute polyarthritis, endocarditis and nephritis. Our examination of the nose and throat failed to show any tonsil tissue or nasal sinusitis. The teeth had repeatedly been *x*-rayed, with negative results. One tooth, however, was a dead one and it was removed in the hope of helping the condition. There was

considerable disease around the root of the tooth; culture showed Streptococcus hemolyticus. This and a few other cases have shown to us the futility of relying absolutely upon an *x*-ray examination of the teeth.

One of the two colectomy cases bears brief reporting:

E. M. C., male, aged thirty-five years, was referred in January, 1916, because of frequent sore-throats and rheumatism of five years' duration, dating back to an attack of tonsillitis. The left ankle was first affected, then both ankles, knees, wrists and fingers; swelling and severe pain at times. Constantly crippled during the past year. Has had treatment of various kinds; feels that diet has alone been of value. In February, 1915, fasted absolutely for seventeen days. After seven or eight days rheumatism rapidly decreased, almost disappeared, to return on beginning to eat. Rheumatism grew so severe that in June, 1915, he fasted for twenty-six days; took nothing but water; weight dropped from 170 pounds to 123 pounds, with almost complete relief from pain. Never any tooth trouble. Examination shows a large, strong, apparently healthy man, except for the polyarthritis; cannot raise his arm above the level of the shoulder nor close his hands without pain; limps badly; can walk upstairs one step at a time, but painful. Heart and lungs normal; intestinal tract apparently normal; normal b. m. daily; no indigestion. Wassermann negative. Complement-fixation test for Streptococcus viridans negative. Complement-fixation test for gonorrhea negative. Teeth sound, especially good; not a filling in any tooth. Tonsils show signs of marked chronic infection. Upper crypts contain cheesy masses; tonsils large, red and pulpy.

This case is reported in some detail to show the history of the effect of diet, the excellent general health, the perfect teeth, the definite initial tonsillitis history and the distinct diseased appearance of the tonsils. In this case surely a tonsillectomy was indicated and good results expected. Except for a temporary improvement (due likely to decrease in diet during convalescence) the tonsillectomy was of no value. The rheumatism increased. A further study showed a colon dilatation and a nine-hour stasis. A colectomy was finally done in August, 1916, with gradual improvement. Four and a half years later he reported much improved, working his ranch daily, some stiffness, no recurrence of severe pains; "85 per cent cured" (patient's estimate). It

seems that the colectomy rather than the tonsillectomy was responsible for the improvement in this patient.

The figures shown in the general health table were obtained from questionnaires from the patients. It is rather noteworthy that 78 of the 111 patients reported their general health improved or much improved. There were 2 chronic cases in which organic heart disease had existed for years. They were operated largely because of the heart condition rather than because of the rheumatism, which though existing was not severe. Both cases were operated under local anesthetic, did well, so far as the operation was concerned, but died two years after the operation without having received any value from the tonsillectomy. It was thought that the tonsillectomy had no ill-effects on the heart.

Conclusions. The difficulties of the problem of selection of operative cases are, of course, common to us all. It has been the writer's experience to find that adult patients suffering from toxic symptoms are referred to the laryngologist for his decision as to whether or not the tonsil is the seat of a chronic infection. Other patients come with the statement that their tonsils have been pronounced infected or that a culture that has been made from the crypts showed chronic infection. The writer has taken some pains to inform all such patients that every adult's tonsil is a chronic infected tonsil from which a positive culture can be made. The same is probably true of most tonsils in children. Therefore the necessity for a tonsillectomy depends not solely upon the examination by a laryngologist, but upon a complete study of the patient to determine all possible factors responsible for the invalidism—rheumatism, heart trouble, etc. Charlatanism in the pseudospecialist has thrived to a large extent by virtue of the rather firmly rooted impression of the need of the removal of all infected tonsils. It seems to the writer that laryngologists should combat this idea, which is common, at least in my vicinity, to a rather large part of the general medical profession and general public. Overenthusiasm on the part of many conscientious men has also been responsible for much unnecessary surgery. Sharp lines of selection of operative cases cannot, of course, be drawn, but there is urgent need at this time for careful group-study of all tonsil patients, and a decision for or against tonsillectomy in any given case is ill-advised until this had been done.

RHEUMATIC CASES—RECOVERY AFTER TONSILLECTOMY.

Name.	Age.	Duration.	Rheumatic history.	Tonsil history.	Physical examination.	Cured.	Time since tonsillectomy.
Mr. J. L.	52	1 year	Pain severe, shoulder, orthopedic treatment of no avail. Chronic sufferer	.....	Chronic arthritis (capsular; myalgia arm	Cured	6 months.
Mrs. H. McF.	33	Years	Sciatica, general myalgia	.....	Myalgia	Cured	1½ years.
Mrs. F. N.	39	1 year	Pain in ankles, knees and fingers. Bedridden for 10 weeks in one attack following tonsillitis	Tonsillitis	Chronic arthritis	Cured	2 years.
Mrs. H. R. P.	32	1 year	Pain, stiffness in ankle, crippling constant; persistent orthopedic treatment with no result	Frequent tonsillitis	Chronic arthritis; ankle	Cured	2 years.
Mrs. E. L. P.	46	4 months	Pain in fingers, wrists and ankles	.....	Chronic arthritis with thickening	Cured	6 months.
Mrs. C. R.	27	3 months	Pain, stiffness and swelling of knees. In cast for 1 month without improvement	Quinsy, 4 years	Chronic arthritis with effusion	Cured promptly	4 years.
Mr. W. P. R.	37	1 year	Shoulder pain	.....	Myalgia	Cured	1½ years.
Mr. R.	35	5 years	Recent pains, stiffness in fingers, moderate severity not crippling	No throat symptoms	No swelling, slight stiffness	Cured	2 years.
M. E. S.	40	6 months	Knees, hips, shoulders, periodic, severe	Frequent tonsillitis	Chronic arthritis, probably capsular	Cured	2½ years.
Mr. S.	38	4 years	Recurrent pains and stiffness in wrists, elbow, shoulder; relieved by local tonsillectomy cleansing temporarily crippling	Soreness, left tonsil, relieved by cleaning out large crypt	No swelling, probably capsular	Cured	4 years.
Mr. C. S.	36	2 weeks	Severe pain in shoulder	.....	Probably capsular	Cured	3 years.
Mrs. F. E. S.	40	3 months	Pain in knees, shoulders. Recent attack of pyelitis with fever followed tonsillitis	Tonsillitis 3 months ago	Chronic arthritis, knees and shoulder, probably capsular	Cured	1½ years.
Mrs. T. L. T.	46	6 weeks	Pain, ankles, feet, hands and heart	Tonsillitis 4 months ago	Chronic arthritis, capsular myalgia; myocarditis with enlargement and murmur	Cured quickly after operation	3 years.
Miss O. E. W.	36	.....	Attacks of pain in feet and arms after tonsillitis	Tonsillitis once a year	Myalgia, no joints swollen	Cured	6 years.
Washburn	31	10 years	Recent pains, stiffness in knees, right arm, nagging for weeks, not crippling; never free for over month or two	Frequent sore throat	No swelling in joints, probably capsular	Cured	1 year.
H. L. M.	47	Years	Pain and stiffness, neck shoulders, wrists, off and on severe	.....	Chronic arthritis	Cured	1 year.
Dr. H. C. S.	47	Acute 3 weeks ago	Acute inflammation, hands, feet. Pneumonia three times	Tonsillitis, streptococci, hemolytic virulent pneumococci	Subacute arthritis	Cured	4 years.

Miss M. A.	35	.....	Pains in arms and legs	Tonsillitis, acute attacks	Neuritis or myalgia	Cured in 4 weeks	4 years.
Mr. C. J. A.	47	2 years	Hip, shoulders, not crippling. Painful at times	.....	Myalgia	Cured	1 year.
G. G. B.	50	1 year	Pain in shoulder, left arm, heart. Disabled 6 months; in bed 2 months on account of shortness of breath. Much treatment of no avail	Tonsillitis 10 years ago	Myalgia, myocarditis; coronary insufficiency (crippling)	Cured (can walk a mile)	7 months.
Mrs. M. L. C.	38	1 year	Severe attacks, pain in neck and shoulder	Tonsillitis attacks	Probably myalgia	Cured	2 years.
Miss M. C.	40	1 year	Pain and stiffness, shoulder, foot and finger	Tonsillitis attacks, last one 6 months ago	Chronic arthritis capsular (probably) partly crippling	Cured in 4 months	1 year.
Miss M. E. C.	27	8 years	Severe pains, finger-joint, knees and hips	Tonsillitis	Chronic arthritis	Cured	3 years.
F. M. D.	35	6 months	Pain in shoulder	Tonsillitis	Probably myalgia	Cured	2 years.
Mrs. C. A. E.	56	1 year	Pain and stiffness, knees and hands. Joints tender	.....	Chronic arthritis (no marked swelling)	Cured in 6 months	1½ years.
Mr. E. B. E.	51	Years	Pain and swelling, severe attacks, toe, crippling	Quinsy attacks	Chronic arthritis	Cured	4 years.
H. W. D.	54	7 years	Fingers, wrists, knees. Pains and stiffness often severe, partly crippling	.....	Finger joints thickened	Cured	1 year.
Mrs. J. D. D.	35	Years	Pains in arms and legs	.....	Myalgia	Cured	1½ years.
Mrs. P. H. G.	38	3 years	Pain and stiffness, shoulder, ankle, wrist, neck, not crippling	Tonsillitis, Quinsy	Chronic arthritis moderate capsular probably	Cured	1½ years.
Mrs. E. H.	32	2 years	Pain, swelling in knee, crippling, orthopedic treatment; rest, crutches, etc.	.....	Chronic arthritis with effusion	Cured in 2 months after operation	1 year.
Dr. L. H.	47	3 years	Pain in hands, knees, not crippling, but severe at times	Tonsillitis	Chronic arthritis capsular	Cured	1 year.
A. W. LaC.	35	4 years	Pains off and on, with swelling of ankles, crippling for 5 or 6 days at a time	.....	Chronic arthritis	Cured	2 years.
L. A. J. LaM.	33	3 weeks	Pain, swelling in wrists and elbow with fever, followed tonsillitis in tonsil stumps, bedridden for 3 weeks	Tonsillitis	Acute arthritis	Cured	2 years.
L. R. B.	38	1 year	Pain, back, knees, shoulders	.....	Chronic arthritis mild, probably capsular	Cured	1½ years.
Mrs. G. A. H.	38	2 years	Pain, back, legs	Tonsillitis, quinsy	Myalgia	Cured	4 years.
Mrs. W. H. S.	52	1 year	Pain, stiffness, fingers, feet; orthopedic treatment, no result. One tooth removed, no result	Sore throat	Chronic arthritis, fingers, toes	Cured	1¼ years.
W. E. R.	47	6 months	Pain, shoulder, neck	.....	Chronic arthritis	Cured	1½ years.
Miss E. A. G.	30	10 months	Pain, severe, hands, arms, legs	.....	Chronic arthritis, hands elbows. Sciatica	Cured	2 years.

RESULTS OF THE *X*-RAY AND RADIUM TREATMENT OF TONSILS AND ADENOIDS

D. BRYSON DELAVAN, M.D.

The prevalence of diseased conditions of the lymphoid tissues of the pharynx is, unfortunately, too well known to us. The Board of Health of New York City has estimated that relief would be required for 55,000 children of the public schools alone for the present year. As has long been recognized the treatment of these cases by surgical methods, although generally satisfactory, often falls short of the ideal possibilities of prophylaxis and relief. Thus considering the drain upon the public resources and the possible injury to patients operated according to present methods, it is highly desirable that more scientific and less complicated treatment be found and utilized until successful preventive measures shall have made the diseased tonsil a thing of the past.

Of the methods hitherto employed, however, surgery has given infinitely the best results. Medical treatment and serum therapy have offered little relief. When, therefore, an entirely new method is proposed it is most desirable that it should be received not with unreasoning opposition, but in a spirit of friendly inquiry and its claims for recognition thoroughly tested.

The suggestion recently made that diseased conditions of the tonsils can be radically cured by the application of the *x*-ray, and also of radium, is one of unusual interest. The investigations which have led to it have been conducted with the best scientific ability under highly favorable conditions. Whatever may be the ultimate result, their novelty, the earnestness with which they are being carried on and the possibilities of their success should challenge our attention and our respect.

The advantages claimed for the method are: (1) Reduction of the size of the tonsil; (2) inversion of the openings of the crypts;

(3) lessening of the depths of the crypts. Obviously, all of these results are greatly to be desired if the avowed end to be obtained is a condition of free drainage of the crypts so complete that no infectious matter can be retained by them.

We will first consider the *x*-ray treatment. The investigations of Dr. T. B. Murphy and his associates, pursued for several years past at the Rockefeller Institute, New York City, upon the effects of the *x*-ray upon lymphoid tissue in general and particularly upon that of the tonsil, especially appeal to us as offering possible relief from present methods for the treatment of diseased tonsils. In order to present the results of Dr. Murphy's work with all clearness, I will quote, with his permission, from his latest thesis:[1]

He says: "In work carried on by us over several years we have extended the original observation of Heinicke[2] on the susceptibility of lymphoid tissue to the *x*-ray and have shown other ways in which the *x*-ray may be employed as a therapeutic agent. It may be regarded now as established that the lymphoid tissue is more highly susceptible to the *x*-ray than any of the structures of the body except the sex glands, and that by suitable exposures it is possible to remove almost all of the lymphoid tissue without inducing detectable changes in other organs or tissues.[3] When the doses of the *x*-ray are properly graded even the total number of polymorphonuclear leukocytes remain unaffected while the lymphocytes fall to a point at which few are seen in the circulating blood.[4]

"The use of the *x*-ray for reducing enlarged lymphoid organs is not new, but in the past the doses employed for the purpose have been large and thus have approached the danger-point so closely that it has been resorted to only in extreme instances. If, as our work indicates, extensive reduction of lymphoid tissue can be induced by small doses of the *x*-ray well within the safety limit, there is no reason why the *x*-ray should not be used as a therapeutic agent in a variety of conditions. For obvious reasons the tonsil has been selected for the purpose of testing this point.

[1] Jour. Exp. Med., June, 1921.

[2] Heinicke, H.: Mitt a. d. Grenz. d. Med. u. Chir., 1905, xiv, p. 21.

[3] Murphy, J. B.: Jour. Am. Med. Assn., May 9, 1914. Murphy and Ellis: Jour. Exp. Med. 1914, xx, p. 397. Murphy et al.: Jour. Exp. Med., 1919, xxix, p. 53.

[4] Taylor, Witherbee and Murphy: Jour. Exp. Med. 1919, xxix, p. 53.

"Histological examination of the tonsil shows it to have a structure similar to that of other lymphoid glands, with the exception of the fact that it is covered on one side by mucous membrane with crypts dipping down from the surface. These crypts have been described as natural test-tubes for the growth of bacteria. Whether or not the presence of pathogenic organisms in the crypts is the source of hypertrophy of the organ or whether the hypertrophy arises from another set of conditions is a moot point. It is, however, agreed that enlarged tonsils with resultant poorly drained crypts have a pathological significance.

"In addition to the enlargement of the tonsil, other lymphoid deposits showing hypertrophy occur through the mucous membrane of the pillars of the fauces and as masses back of the posterior pillars.[1] These structures also become pathologically altered in much the same way as the tonsil. They are not subject to surgical removal as is the tonsil, but since they are made up of lymphoid cells are subject to influence by the *x*-ray.

"A series of studies was undertaken in order to test the effect of small doses of the *x*-ray on the tonsil and other lymphoid deposits of the nasopharynx.

"The following technic was adopted: The individuals to be treated are placed on a table with the head tilted so that the axis of the *x*-ray may pass under the angle of the jaw into the region of the tonsil. The area exposed on each side of the neck is about three inches square, the surrounding surface being covered with heavy sheet lead. The factors governing the dose of the *x*-ray to each area were as follows: Eight inch-spark-gap measured between points, 5 milliamperes, ten inches' distance from the target to the highest point of skin exposed; the time varied from three to seven minutes, depending on the age of the individual, and the *x*-ray was filtered through 3 mm. of aluminum. The approximate value of this dose is from one to one and three-quarters skin units. After an interval of a few weeks this treatment may if necessary be repeated with safety. To ensure immobility in young children a special board has been used with retaining straps and the child's head secured by means of a gauze bandage.

[4] See also French, T. R.: Retention Crypts in the Infratonsillar Nodules, as harbors of Pathogenic Bacteria. New York Med. Jour., June 19, 1920.

"When excessive adenoid tissue was present a third area was exposed, namely, the back of the neck, just below the posterior occipital region with the head tilted forward. But this site of entry for the *x*-ray is less favorable."

Dr. Murphy's report is based on the study of 46 individuals ranging in age from three and a half to forty-five years and observed one month or longer after treatment. About 40 other patients were treated, but as they did not return for examination they have not been included. The condition of the tonsils was noted in each individual and a drawing showing the size made by an artist independent of the examining physician. The state of the tonsils on first examination varied, from that of simple hypertrophy to the enlarged organ with ragged surface and deep crypts containing exudate, or the small pathologically altered tonsil associated with symptoms of systemic disease. None were treated at a time when the throat showed signs of acute inflammation.

The histories of ten selected typical cases are given in the original article and drawings of some of these showing the progressive changes in the throat.

"In general it may be said that the reduction in size of the tonsils and other lymphoid deposits in and behind the pillars of the fauces becomes clearly evident about two weeks after treatment and increases for one or two months. As the tonsil shrinks the crypts open and drain, and finally the edges become inverted and the surface grows smooth and healthy in appearance. The small lymphoid deposits in the pillars and the larger accumulation frequently present behind the posterior pillars of the fauces disappear promptly after the treatment, and at the same time the injection of the vessels subsides.

"The adenoid tissue at the vault is, as expected, in view of the portal of entry used for the *x*-ray, not so uniformly reduced as the tonsils. This particular aspect of the problem of reducing excessive lymphoid tissue in the nasopharynx through the *x*-ray is one to which in the near future special attention will need to be given."

Turning now from the study of the *x*-ray to treatment by radium: At the meeting of this Association last year, in the course of my contribution to the symposium upon radium in the treatment of conditions of the upper air passages, I said as follows:[1] "Recent

[1] Trans. Amer. Laryn. Assn., 1920, p. 87.

improvements in the production and control of the *x*-ray have imparted to it properties which closely resemble those of radium. Thus far, however, the difficulty of concentrating the *x*-ray upon a given circumscribed locality and of applying it from within such enclosed cavities as the larynx and nasal region, render it less adaptable to growths of the upper air passages than radium, which, easily manipulated and capable of being so regulated as to allow of its action being absolutely confined to given fixed limits, far surpasses for our special purposes the *x*-ray."

The treatment of adenoid hypertrophy at the vault of the pharynx by the *x*-ray method does not seem thus far to have met with marked success. It is not surprising to note that the results of treatment recorded are vague and apparently unsatisfactory. Radium, on the other hand, is much better adapted to the purpose and more likely to yield satisfactory results. When precise dosages for the treatment of the lymphoid hypertrophies of the tonsils, tongue and pharynx have been established and reliable protection of the adjacent parts has been secured, the radium method of treatment will probably be if not the more available at least the more adaptable and the more efficient of the two.

In a communication received May 20, 1921, from Professor James Ewing, director of the Memorial Hospital, New York City, he says: "Professor Forssell, director of the Radium Instutute of Stockholm, Sweden, spent some weeks at the Memorial Hospital last summer and told us that he had for three years been treating enlarged tonsils by radium with excellent results, and as a routine measure he said that it was contraindicated only in acute tonsillitis. We have treated several cases at the Memorial Hospital with good results."

Professor Ledoux LeBard, the distinguished radiologist of Paris, has been using the *x*-ray for the reduction of enlarged tonsils for more than two years past.

In the *Boston Medical and Surgical Journal*, March 10, 1921, there appeared an article by Dr. Francis H. Williams entitled "The Treatment of Hypertrophied Tonsils and Adenoids by Radium: A Preliminary Statement."

Dr. Williams says: "The excellent paper recently published by Drs. Murphy, Wetherbee, Craig and Hussey, entitled 'Induced

Atrophy of Hypertrophied Tonsils by the *x*-ray,'[1] is interesting and instructive, but treating the tonsils from 'under the angle of the jaw' and the adenoids 'through the back of the neck' is open to the criticism of exposing to the rays other parts than those it is desired to reach. The rays from radium also act on the lymphoid tissues, of which the tonsils and adenoids are made up to a large extent, and can be applied directly to the tonsils and adenoids, the neighboring parts being protected by lead—that is to say, the radium container is covered with lead except on the side through which it is desired that the rays should issue. When, as above, the *x*-ray was used the maximum amount reached other tissues than the tonsils and adenoids; when radium is employed the maximum radiation reaches the tonsils and adenoids and the minimum other parts. Another advantage of radium is that the output is constant and the dosage can be exact.

"I have used 50 mg. of bromide of radium in a flat container with the rays filtered by 0.83 mm. of aluminum held directly against or near the tonsil. The radium should be withdrawn every few minutes, or as often as is comfortable for the patient, until the total exposure of fifteen minutes, more or less as required, has been reached. Improvement follows promptly, but the ultimate results may be expected only after some weeks. Guided by more than seventeen years' experience in the use of radium it seems to me better not to attempt complete healing by one treatment, for the present at least, but rather to give two or perhaps three treatments at intervals, as patients and conditions differ.

"It may prove more convenient to use a container by means of which both tonsils may be treated at the same time. I have devised one to be held midway between the tonsils, which consists, in general, of a disk of lead (not more than 2 cm. in diameter and about 1 cm. thick, more so in the middle) with a hole bored through its center, somewhat flared at each end, for the exit of the rays, and another bored from the outer edge radially to a little beyond the center. The tube containing the radium may be slipped into this and the opening afterward closed by screwing a metal handle part way into it. The uvula, the back of the throat and the parts

[1] Jour. Am. Med. Assn., 1921, lxxvi, 228.

behind it are thus protected by about 1 cm. of lead. When treating one tonsil only the opening toward the other may be closed with a plug of lead. Appropriate filters should be used."

Another instrument, useful to reach parts of the throat that would not be accessible to a larger one, is shown in an illustration which accompanies Dr. Williams's article.

He continues: "Before applying the radium the throat should be moistened with a suitable solution of cocain to prevent gagging from the insertion of the container. All instruments should be covered with two thicknesses of rubber, and for this purpose two rubber finger-cots are stretched over them and far down on the handle, where they may be secured by a strip of plaster. Of course, fresh cots should be used for each patient.

"In using this method I have thus far treated the tonsil only, as the results there may be more easily observed than in adenoids. These may be reached through the nose by a small instrument, carrying radium, from the end of which the rays issue upward.

"Adenoids can also be reached by directing the *x*-ray upon them through the nose instead of through the back of the neck, as described in the article of Dr. Murphy. This treatment might be carried out, for example, by distending the nostrils with a special bivalve speculum, one blade inserted horizontally in each nostril, and by protecting the skin inside the speculum with oxide of zinc plaster and that outside by sheet lead. In this case the length of exposure would be shorter, for children only about one minute, than when the rays are obliged to traverse a large amount of dense tissue, and the risk of burns would be far less.

"The disadvantages of operation are obvious. The *x*-ray should be employed only by physicians who have had experience in its use.

"It is, of course, too early to make a definite statement concerning the comparative value of operation, *x*-ray and radium. For adenoids the *x*-ray and radium—treatment by both of which is painless—may each be of service in a special group of patients. For the tonsils, radium, if properly used, I consider the safest, and that it will probably prove to be the best treatment for many patients.

"While not coming within the title of this paper, it is noteworthy that after treatment by radium I have observed striking improvement in acute and subacute tonsillitis."

Summarizing what has been said, recent experimentation has proved that very small amounts of the *x*-ray are sufficient for the reduction of lymphoid tissue, doses so small, in fact, that no injury is said to result to other parts from its application. The question as to whether the pituitary body may be injured in efforts to reduce adenoids by this method is positively answered by Dr. Murphy in the negative. Moreover, the current used is too weak to affect even the external integument. Under an exceedingly weak current the lymphoid tissue is effectively destroyed and no scar tissue is left behind. One of the most desirable results claimed for the treatment is the destruction of redundant lymphoid elements outside of the tonsil, such as French's "infratonsillar nodules," and the deposit often found upon the lateral walls of the pharynx immediately posterior to the pillars of the palate. Another of its most valuable possibilities is the destruction of redundant lymphoid tissue at the base of the tongue. If it should prove a reliable cure for the always troublesome lingual tonsil it will be welcome indeed.

As to the sterilizing of the tonsil the mechanism of that proceeding is clearly explained. The *x*-ray itself does not destroy bacteria. It acts by so modifying the crypts that free drainage from them is secured, and thus they are emptied and continue to be emptied of all offending contents. The infection of the tonsil will disappear as the tonsil atrophies, from the opening up and drainage of the crypts.

It has been my practice for many years, in properly selected cases, to surgically open disease-retaining crypts, so that free drainage might be secured. The results in many cases of systemic infection have been excellent. The principle of this is the same as that suggested by Dr. Murphy.

The question will be asked: What effect will the ray have upon chronic abscess of the tonsil? The answer must be: None, since the ray does not affect bacteria.

The degree of atrophy desirable to be induced by the treatment is an interesting question. Should the gland be completely extirpated by it or should the fact that Nature has implanted lymphoid tissue in the normal pharynx be respected and a certain amount be allowed to remain? It would seem that treatment by radiation

admits of some latitude in this direction. By the administration of very small doses limited results can be obtained. Additional applications will give further reduction of volume. When the desired degree of atrophy has apparently been secured the treatment may be discontinued, to be resumed in the future in case of need. But to remove every vestige of the tonsil has always seemed to me unnecessary and illogical. Moreover, the outer aspect of the capsule of the tonsil, which was evidently intended by Nature to assist in the support of the adjacent wall of the pharynx as well as to protect the underlying parts, would by this method be preserved, as I believe it should be.

Dr. Murphy maintains that in the case of the so-called fibrous tonsil little atrophy will result from radiation, as the ray has no effect upon fibrous tissue. Here for the present surgery must hold its own.

That the method of treatment by radiation will quickly come into general use is improbable. Knowledge of the safe and effective use of radiation, whether the *x*-ray or radium, is acquired only through highly intelligent study and much experience. It is one thing to possess radium, quite another to apply it with safety and skill. Far better that experiments in this new field be carried on by those qualified for the work than that the success of a method of such good promise should be compromised and perhaps discredited through errors due to incomplete understanding of the medium or to faulty technic in its application.

There can be no doubt that the future of radium is full of brilliant promise. What has already been learned concerning it is, however, but the beginning of the knowledge required. Even in the application of it and of the *x*-ray to the elementary purposes of which this paper treats, questions arise which must be answered before the procedure can be relied upon as thoroughly understood and absolutely safe. No matter how small the dosage, assurance must be given that tissues not intended to be influenced by it shall not be attacked and harmed, especially in the case of a region so richly supplied with important elements as is the neck.

While greater experience is needed to prove the ultimate reliability of radiation administered upon the lymphoid elements of the pharynx and to finally establish the best means for its safe

and efficient application, as well as to determine the relative desirability of the *x*-ray as compared with radium, it cannot be denied that what has already been done has developed facts and questions of the greatest interest, questions not to be settled by theoretical discussion, but by painstaking experimentation and accurate scientific observation. The suggestion of its value in these cases bears splendid possibilities—the fulfilment of them is worthy of our best efforts.

MUST IT ALWAYS BE TONSILLECTOMY?

HENRY L. SWAIN, M.D.

In every community there is a large number of persons who stand in need of something done to their tonsils. In these days a conscientious operator stressed a bit, perhaps, by popular opinion, lay and professional, feels that he is negligent in his duty to his patients and colleagues if he does not always do a tonsillectomy when the tonsils are the objects of suspicion. If he is in "the swim," so much work in that line stares him in the face that he feels that he must,

> "Count that day lost,
> Whose low descending sun
> Views from his hand,
> No tonsillectomy done."

If he is possessed with the idea that there is no other way to meet the requirement of an honest opinion of "the tonsil menace" except to enucleate, then the above couplet is not merely slightly satirical, but really a confession of faith, his form of fanaticism.

Every once in a while one nowadays hears an echo of remonstrance, gradually swelling into a real murmur of protest, as was expressed to me the other day by a wealthy lady whose erudite medical consultant wished to give her the benefit of every doubt, and so five years ago they started to put her through a variety of "stunts" to find out the cause of her rapid heart action. The empirical surgery of the day was called into requisition—rank empiricism she chose to term it—a perfectly just criticism of the spirit of the times. If somebody gets relief from having his tonsils out then why not try it on everybody who has the same symptoms? If an appendix made one person have certain troubles, why may it not do so to the next? Teeth, appendix and tonsils can and do

make a lot of trouble. Let us eliminate them, and so we all often do without much evidence of a positive nature. This removal of *organa non grata* occurs so frequently and safely in these days, thanks to the skill and wonderful technic of the surgeon and operating room personnel, that we beome a bit callous and forget some sad facts. For instance, in one year in my own small sphere of activity I know of several cases of lung abscess, and all that they sometimes mean, and one death, just to settle the question of a possible connection of the tonsils with focal disease; and one in which an innocent and valued life was shortened when he consulted a stomach specialist, who advised that the teeth be removed. The dentist did some, the undertaker the rest! And this happens now and then everywhere. Is it right? But to return to the lady. First she had all her teeth out, because so many seemed to possibly be a source of trouble. Failing here, they eliminated her tonsils, a most uncomfortable, distressing and weakening experience for a woman of sixty years plus. As she somewhat naïvely put it, "And I am now consulting you for the sore-throats which were surely to be relieved by this mild (?) procedure." Failing again, they attacked a rectal condition as surely the cause of the trouble. Incidentally they did some local good there, although the heart still went on its merry, rapid, tantalizing way. Then they did something else, I seem to have forgotten about that; failing there, she went to Johns Hopkins, where elaborate *x*-ray, laboratory tests and other things were done to her. She was threatened with another flight of surgery, but went home to consult her family. While seated in the train she fell into conversation with a well-known medical man, who himself had been the victim of much empiricism and who was advised—equally empirically—to see if milk and milk products were not the cause of his trouble. They were, and he advised her to try it, and in her case they also were. If she avoids milk and milk products, except a sparing amount of well-made butter, she has no trouble; and this was three years ago. Previously she had been for a long time on a purin-free diet. When she contemplates with a degree of charity, which is as rare as it is exalted, what a well-meaning surgery has done to and for her, she sighs and merely says she wishes she had her teeth back. I was only with the greatest struggle prevented from reciting to

her what a wag friend of mine delights in flaunting before me from time to time:

"The lives of rich men oft remind us,
Of the operations that are done,
Not always because sore needed,
But because they have got the "mon."

In what precedes in the history of this lady in question we see what always arouses the most violent protest in my soul—a lot of guesswork with surgery as the potent factor. In her case she still lives, but ought we not to labor without ceasing to arrive at more exact methods?

Are we forever to go on trying with knife and guillotine to undo the mischief done instead of pausing to consider the mischief-maker? Shall we never have time when trying to put out the fire to consider ways and means to prevent its origin and spread? How much time do we, who are thus assembled to listen to discursive remarks like these, ever give to the question whence came these germs whose unwilling hosts we are? Do we sufficiently encourage by even the briefest review the patient work of the laboratory man who if we would but listen to him could tell us much about the life-history of many a germ? And might he not do more if we all of us went to him and helped him in his studies by giving them the human touch, so to speak? He knows now that you can take the most virulent germ and by passing it through certain cultures entirely change its characteristics. Acid-fast may become non-acid-fast, and *vice versa;* pathogenic may become non-pathogenic, and *vice versa.* Properly encouraged and stimulated by your broad-minded personal interest, might we not learn the earlier sources of these germs and prevent them from ever becoming pathogenic? And would that not be the greater miracle? However, we must so far, as the result of our mental habits, ever devote our earnest endeavor to put out the fires already started; but in so doing should we not, when the question, for instance, of focal disease in the adult is concerned, ask ourselves—"Is there not some other way—safe, sane and sure—to prove a tonsil either as guilty or of making it guiltless, or both, without putting all the patients always through an ordeal of tonsillectomy?"

For years in cases not seeming to require very radical measures I have been working with a method which has turned out in many cases to do exactly what is suggested in the last sentence. While debating whether my conclusions were worth chronicling before this distinguished body, I have learned that others, by other processes, have accomplished very brilliant results and proved to be true the very conclusions which I have drawn.

The three methods which give class and distinction to this work are, first, that of Irvin Moore in the use of caustic paste in the shrinking and actually removing of undesired and undesirable tonsil tissue, and very lately the splendid idea of using the potent *x*-ray, as has been done now by numerous operators, but which was first called to my attention by the articles by Wetherby and by Murphy and his collaborators, who are working at the Rockefeller Institute in New York. And lastly, and by no means least, we are to hear from our beloved and distinguished fellow-member, Dr. Delavan, of the use of radium for this same purpose. The action of these two is similar, but in the case of the latter, so very simple in its application, as is evidenced by F. H. Williams,[1] when compared to the extensive apparatus necessary for properly controlled dosage by *x*-ray.

The object of all is to eliminate the tonsil as a trouble-maker, and at this point might it not be profitable to consider the question, if a faucial tonsil is projecting more morbid matter into the system than any other part of the ring of Waldeyer, what part of the tonsil does it? What constitutes the difference between the tonsil which does and the one which does not? If anyone not accustomed to giving the subject much consideration will take the pains to pass a probe with a short right-angled curve into any of the usual crypts of the tonsils he will be wonderfully surprised at the ease and frequency with which the probe can be made to slip under and come out through another cryptal opening. This tract leading from one to the others is usually at the bottom of the crypt, often right up against the capsule, and communicates with the bottom of another crypt or crypts. Such fistulous tracts probably come because the deepest parts of such crypts have been dilated when

[1] Treatment of Hypertrophied Tonsils and Adenoids by Radium. A preliminary statement, Boston Medical and Surgical Journal, March 10, 1921.

evacuation was interfered with by swelling at the outlet, and simple pressure on the intervening walls caused absorption, or when particularly virulent matter may have caused active erosion to penetrate the wall and thus make a single cavity in the depth with two or more outlets. These caves or cisterns are full of fluid matter at all times, never sterile.

It is the crypts with recesses and tunnels beneath the surface, which cannot cleanse or evacuate themselves, which usually constitute the threat or menace of an evil tonsil suspected of causing focal disease. At times the more fluid parts run out, leaving the cell detritus behind, and we have a cheesy substance which, when large enough, comes out as a separate mass, quite odorous and often complained of by the patient. These masses to my mind are never as momentous as is the menace of the fluid stuff which preceded them. Unless actually diseased, as in tuberculosis, syphilis or cancer, which are not being considered at this point, the usual tissue intervening between the crypts of the tonsils absorbs perhaps, but practically never in itself constitutes any threat. If it does then every tonsil does, and there are many square inches of such threatening tissue all over the base of the tongue, tonsillar-lingual folds (French), lateral columns and posterior walls of the pharynx, and, worst of all, in the region of the vault of the pharynx, where the pharynx tonsil—adenoid—is or was. So I think it is logical to say that the lymphoid tissue in itself, even when thickened and hypertrophied, constitutes no actual menace. It is only when it harbors exudate, in pockets which cannot be easily cleansed and flushed out by the outflowing secretions of racemose mucous glands, which always empty numerously and copiously into the apex of the crypts, that it will make trouble. Said retention areas unquestionably exist wherever the crypts or pockets communicate under the surface. Speaking as we are of the faucial tonsils, we should bear in mind that they are completely delimited by a definite, firm capsule, which a wise and beneficent Providence created, so that those of us who almost always operate with the snare tonsillectome can do a neat, clean job and remove the mass *in toto*. This limiting membrane is so constituted as not to of itself absorb, and during operations is penetrated, when not too much traumatized, only by the lymphatics and bloodvessels.

When these pockets constitute real abscess cavities, as they appear sometimes to do, then this very squeezing to which we subject them, when the tonsil is removed entirely and solely by the cold snare, must force the fluids of these submerged pockets into the lymphatics and general circulation, and once in a while it produces a severe constitutional reaction immediately following the operation. Otherwise we see this matter ooze onto the surface of every tonsil as the snare cleaves it from its bed. This very foul secretion gets down into the blood and secretions in the throat at the time of operating under a general anesthetic and so gets into the lungs, sometimes making the much-dreaded lung abscess.

This possibility of forcing poisonous matter into the system constitutes my reason for invariably adhering to the plan never, if possible to avoid it, to operate while acute inflammation renders the germ activity of all the fluids in the tonsillar crypts more potent for evil.

That others have operated with impunity in the midst of a quinsy or other acute seizure by no means leads me to go against my reason, since some very unhappy results have occurred.

On account of the above-mentioned facts, even when intending later to do a tonsillectomy, I like to proceed just the other way. I like to slit up all the pockets, to get rid of all known and accessible retention areas, subdue all active inflammation and then see what happens. If favorable results occur, all well and good. Particularly does this line of treatment commend itself in tonsillectomy on the adult when one expects to do the operation under local anesthesia or, better still, nerve-blocking.

Since I have worked in this way a number of interesting things have come to light: First, one can frequently establish by the simple slitting, beyond all peradventure, that certain focal symptoms are due to the tonsil, and freeing this of all disease and retention areas cures the case; second, one can so successfully conduct the work as to free the tonsils of a definite menace, for example, the Streptococcus viridans.

Three years ago, I had a patient who for over a year had had a bursitis in the shoulder, and later, after I saw her, a tender joint in the foot. She had been advised to have her tonsils removed and the date was set. Her dentist steered her to me because she

had definite pus pockets in the gums around two teeth. This pus and the crypts of her tonsils contained Streptococcus viridans. She being nothing loth, even if the dentist was a bit doubtful, we went to work, he to cure the Rigg's disease and I to eliminate the retention pockets in the tonsils. The gums and the tonsils ultimately became free from the streptococcus, the shoulder and the foot well and the patient has remained well ever since. A vaccine was also used to eliminate all question. The first treatment of the right tonsil gave immediate partial relief to her shoulder, and as that was before anything else was done, and was greater than anything else had previously accomplished, there could be no question as to the relation of the cause and effect. Also vaccines alone have notoriously failed to cure these cases. I think here that the gums were first infected, and later the germs affected the whole mouth and tonsils. While I agree with you that "It takes more than one swallow to make a summer," a swallow is a swallow "for aye that." And were this the only instance it would be worth chronicling; but I have observed this almost magical relief from thus simply cleaning up the crypts too many times to have any doubt in the matter, any more than when it has occurred after that exceedingly impressive and spectacular encounter known as tonsillectomy. That is—please observe—we have both established the connection between the tonsil and the distant disease and cured the patient at the same time.

The recent article, already referred to, in the *Journal of the American Medical Association*, January 22, 1921, by Murphy and others working in the Rockefeller Institute, demonstrates that not only can tonsils be shrunken in size by *x*-ray treatment, but the crypts become free from streptococci while being thus treated. My own observations are thus corroborated. Their explanation is the same as mine. The shrinking in size lessens the retention in the crypts and the germs die. They deny any special or specific action of the *x*-ray on the germs themselves.

A young man, directly following a sore-throat, had multiple joint symptoms and was permanently invalided. I was asked if I thought that his tonsils caused the trouble? Matter could sometimes be squeezed out of them when adroitly and firmly compressed. I said I could not rule them out, but I would so treat them that

they would constitute no further menace. This I did so thoroughly that I felt justified in saying that I thought I had them all right. Then he went away to a sanatorium noted the country over for its insistence that the tonsils be removed as a *sine qua non*. They took cultures from the remnants of the tonsils, they introduced hypodermic needles into the tissue of the tonsils and sucked out the matter from the deepest accessible area, and in the end they told him "they guessed they would look elsewhere for the trouble." Perhaps a gall-stone operation or a diet would restore the youth, and they improved him by the latter.

Another instance when the tonsils must be removed: Nothing doing unless the patient complied. Slitting and clipping reduced the tonsils to a sterile mass and the doctor was told that a complete removal had been accomplished. He was more than pleased with the "beautiful tonsillectomy," and then at my request, as an obstinate iritis was now coming on, with further search a pus tube was diagnosed and removed. The patient is in blooming health. (I forgot to add that previous to my efforts she had many of her teeth out, with no benefit.)

Case after case seems to prove that if there is no glandular—lymph node—swelling in the neck, which always means unquestionable absorption, and the crypts are cleansed and sterilized of any suspicious streptococci, one is justified in claiming such a tonsil is not producing evil of itself, the reasoning being that these treatments can be so thorough that nothing need be left which will reasonably harbor pathogenic germs. Every once in a while one will score a failure, just as he often does when he does a major tonsillectomy, a very good argument, it seems to me, in favor of giving the weak and the timid a chance to get by without the harder, dangerous work.

I have particularly in mind, as I write these words, meeting on one occasion, socially, a very blooming specimen of comely womanhood. The young matron greeted me by name, and as I presume my face did not show the response expected, she laughingly accused me of not recognizing her. Then suddenly I exclaimed, "Yes, I do; but what has happened to you?" "Nothing but your own handiwork." She had some two years previously been compelled by family happenings to discontinue work which I had been doing

on the tonsils, and I remember that at the time I regretted very much indeed not being able to finish up. She had been very strongly urged to have the tonsils out (as you will see, a most excellent advice), but dreaded it because she was at that time so weak and miserable. She had a lot of various things the matter with her, and there was enough glandular infiltration in the neck to make anyone suspicious of the connection with the tonsils. I proceeded as usual to slit up the crypts and punch out all undermined areas, finding in one tonsil a real abscess. Although her course of treatment was only about half-done, she was compelled to stop, but had already begun to improve. In spite of ceasing all treatment she gained twenty pounds, lost her pallor, recovered her initiative and was the transformed individual I discovered. Some wary wag will say, "Think what might have happened if the whole of the tonsils had been taken out?" That you will have to conjecture. I was perfectly satisfied with what my own efforts had accomplished. Certainly, no perfect tonsillectomy, by whomsoever performed, had ever done more. Some tonsil tissue remains, but the pockets are removed.

I can surely and safely affirm that this has happened so often that I know I am not taking too grave chances, that I am never trifling with anybody's lease of life or happiness by suggesting it as an alternative to tonsillectomy. Please let me again state that it is only an alternative, a substitute for tonsillectomy, when from choice or necessity you cannot do the more radical procedure.

The question of daring to do surely enters into a situation such as the one which follows: A lady of some forty-six summers had a most uncomfortable joint affection, flitting around from one to the other, and apparently finally settled in the hands and feet, she being some of the time unable to use either, a predicament hard to beat. In addition, heart action was irregular. She lived out of town and was brought to me a number of times to see if simple slitting could settle the question whether the tonsils were the cause of the trouble.

She certainly was the kind of a case in which if one could avoid a serious operation it ought to be carefully shunned. The tonsils were small, and yet what we would term suspicious, as indicated by French's transilluminator, a much-too-little-used instrument.

Nothing very serious in the way of accumulation of matter in the tonsils was found, but with no other difference in the daily routine from that which had preceded in the previous months, she began to improve, and no one could possibly convince either her or me that the tonsil work did not cure her. Certainly, she went through the two hardest winters' work in her life—the first, while undergoing treatment, when, owing to the circumstance of her husband being in Washington and her help all taken away by war activities, she did her own work at home and no end of Red Cross work, thus having, as you readily perceive, the use of her hands, feet, head and heart—and the previous winter she had been waited on hand and foot. The relief began after four treatments.

I cannot think of anything I have overlooked in making up my mind that these treatments have been the cause of the improvement noted; but in several notable instances, when—as a tonsillectomy itself so often does—it has seemed not to have relieved successive attacks of sore-throat, a little more thorough treatment, applied in the same way to the tonsils themselves, did the trick.

Often when the work done to the tonsils seems to have failed, a bit of attention to the nose and the much-neglected nasopharynx will turn the tide from failure to success. Also, we have been recently shown by Dr. French, of Brooklyn, that accessory tonsil tissue with well-developed, massive crypts and capsule—all the elements of a middle tonsil—often exists in the region between the faucial tonsil and the lingual tonsil. This tissue he was bold enough to attack with a Sluder tonsillectome, having by his transilluminator proved it guilty of criminal possibilities if not intent. Such conspicuous masses have been removed, so well encapsulated, so smoothly and cleanly enucleated that one could readily pass them off as enucleated tonsils. That these can make trouble by absorption and can be made innocuous by milder measures I have successfully demonstrated this last year, and am sure that this explains why when both faucial and lingual tonsils had received their fair need of attention I may have failed by having overlooked this region just mentioned. This region is often forgotten when a real hard tonsillectomy has been done. This brings us to a final suggestion before describing the simple methods I have used in the actual work. It is not a terrible crime, in my judgment, to have

omitted a bit of lymphoid tissue. I do not believe it can be helped. In any case the best operators in the country (which means the world) do and always will, occasionally, leave tissue behind if for no other reason than that it is too small to see, and it later grows to take the place of the removed tonsil. Small bits are apparently frequently overlooked, and especially when working with local anesthesia or nerve-blocking, not merely because of the pain, but because the gagging, bleeding, fainting or other bad actions on the patient's part make us desist from further trial to the patient. I repeat, I consider it no crime to have thus omitted some tissue. By simple slitting and punching out and the galvanocautery shrinking one can later adequately care for this tissue with accuracy and safety, and thus oftentimes avoid the injury to the palate, base of the tongue and the deep tissues of the neck, which can all too easily ensue when rapidly, at the end of a bloody operation, attempting to gather into the snare whatever small fragments it will grasp. The clean cases, which do not bleed, are the very ones which seldom need any extra work.

Understand that in most of what I have said in this paper I have in mind the adult who, having had symptoms of focal disease, is having the tonsil eliminated, but it all may be adapted to tonsils of any age. To young children and the young timorous adult the best work in my mind is always done under a general anesthetic, and naturally when one operates radically he always also removes all adenoids from the nasopharynx.

And now but a few words as to method: After a thorough cocainization of the crypts, inside and out, with a finder one discovers all adhesions with the plica and pillars of the palate and the intercommunicating crypts of the tonsil, and generously and freely opens them up, the bulk of the work being done with Leland's or similarly constructed probe-pointed knives. Then with simple punch forceps bite out or off any tissue which would seem to be liable to grow together again, which will often occur when left to drop together with nothing more than a simple slitting. The tissue between the crypts often has to be snipped out so as to make the cavities cup-shaped or grooved, in which condition when healed over they offer no place for retention of matter deleterious to the system. The rule of work is to do what is convenient and easy of

accomplishment on one side and a week later the other, alternating back and forth, until all pockets are abolished.

If the tonsil is large and the crypts and the pockets deep one has the choice of snipping and removing the superfluous hypertrophied tissue, or one can use the electric cautery, or both. In my own case both are very frequently used. When the tonsils have been thus handled they are not very sore following the treatments, and one can accomplish just as much in the way of shrinking as he chooses, so much so that one can be greeted, as I stated in one of my cases, with the remark, "What a beautiful tonsillectomy!" And it was, at least there was less tonsil tissue visible than after many a so-called tonsillectomy. Furthermore, one rarely gets serious bleeding, accomplishes his purpose without upsetting the even tenor of a patient's life, even by a hair, does not distort or amputate any portion of the palate, and if his work, as we all so carefully do nowadays, is done cleanly, almost no infection can take place. One rarely has to work more than three times on the same tonsil, five weeks of little or no discomfort in all, as contrasted to a patient I have recently seen for the second time who was two months getting over the effects of his tonsillectomy, has forever a distorted palate and troublesome adhesions with the base of the tongue, nearly died from hemorrhage, having to be transfused; all to prove that the tonsil did not cause his sore-throats and colds. I have treated him several times for them since the operation, which I distinctly advised against as probably unnecessary. I say when one contrasts and, as I sincerely believe, can by the former way rule out the tonsil absolutely as the cause of the trouble, why not do it in that way, where appropriate occasion presents itself, especially when, if, as before stated, the tonsil should continue to rebel, a later tonsillectomy has usually only been facilitated?

The genesis of an idea or plan of procedure sometimes is interesting, often a revelation. Years ago when removing adenoids my custom was not always to rip out the tonsils, as is now done as the invariable routine. Then we did it only when the tonsils were large. When I did not remove the tonsils I formed the habit of always, with finger or instrument, liberating the tonsils from the plica and perhaps the anterior pillar of the palate, and was much impressed at the shrinking in size which this produced.

Later I started to do this to the tonsils in cases in which I was about to shrink them by ignipuncture.

Probably I have shrunk more tonsils in this way (ignipuncture) than almost any other extant operator. Naturally, some of my cases have since been tonsillectomized and heads have wagged at the failure of the method, but no oftener than enucleation has itself failed. Since I have done the preliminary slitting, fewer cases have relapsed, and by my present method I can more often completely get rid of all bad tissue than by any but the slickest kind of tonsillectomy. I have done all of this so many years, with careful checking up, that I am venturing to offer this as a substitute in suitable cases, for the much more serious, and in adults painful, enucleation.

In presenting these facts for your attention, there is nothing strange or startling in them. It is only that they represent something definite and positive, and, after all, I beg of you, do not for one moment think that I do not deem it wise to tonsillectomize my own clientele, nor do I in any way desire to cast the slightest reflection on the splendid work of my fellow-conspirators. Quite on the contrary. I merely reaffirm that if one does not care to do a tonsillectomy for any reason I have in this simple manner accomplished just as spectacular, just as wonderful, just as enduring results as I or anyone else has by the major operation, and all that I have said is really in the way of emphasizing, not minimizing, the importance of tonsil work.

May I not in closing quote from the eminent English observer, Dr. Irvin Moore, who, as before mentioned, in the *British Journal of Laryngology*, October, 1919, writes along similar lines, and suggests, when for any reason it is deemed unwise or contraindicated to perform tonsillectomy, the application of caustic paste to the tonsils. He shows some very ingenious cups to hold the paste against the tonsil. The paste is composed of equal parts of caustic soda and hydrated lime mixed with a little alcohol. This escharotic not only actually destroys in successive layers a portion of the tissue by a process of disintegration but also devitalizes a subjacent layer, causing it to become soft and friable. During the devitalizing process the tonsil undergoes general shrinkage. The largest tonsils have been reduced to normal size, while in the case of

diseased tonsils there has been no blocking up or sealing up of septic crypts, as may occur with the galvanocautery.

Though the treatment by this escharotic paste can never be expected to take the place in suitable cases of complete removal of the tonsils by operative methods, yet experience has undoubtedly shown that it is a highly effective and valuable alternative in cases so frequently met in which the risks of excision have to be seriously considered or where the radical operation is refused.

Now that it has been so definitely proved what can be accomplished by these various methods, and especially by *x*-ray and radium, the pendulum may be expected to swing well over to the other side of the arc; but for myself, when advising patients, I shall continue to do as I have already done in numerous instances. First get rid of the main pockets and adhesions as outlined here. Then have them have their *x*-ray or radium treatment. This should prove to be adequate to produce all needed elimination when it is elected as the method of choice; but, as suggested by Stewart in the *New York Medical Journal*, January 4, 1919, it can never be expected to exceed in efficiency a clean, perfect tonsillectomy except as the effect of the rays shrinks other parts of Waldeyer's ring of lymphoid tissue as well as faucial tonsils. Also, it will be reasonable to expect that certain shriveled-up, sclerosed and atrophied tonsils even when presenting some considerable mass will not shrink or be altered by the radium activity by whatever means administered, as will others even smaller when composed of the usual type of tonsil-tissue.

Discussion on the Tonsil Papers

Dr. Joseph L. Goodale, Boston, Mass.:

I think that the Society is extremely fortunate in having listened to these three papers, which show that there is still something to be said in regard to the subject of the tonsil. I want to ask Dr. Hastings if it is possible for him to ascertain whether there has been an unusually large proportion of what we might call anaphylactic types among the 20 per cent of arthritic cases that failed to show improvement. I ask this because he suggested the hypothesis that certain arthritic cases may conceivably be explained on the ground of previous sensitization

of the joints which in subsequent infection were again brought into prominence—not through direct penetration of bacteria but through toxins generated in the tonsils finding response in the joint. I have myself seen a case of what I have called ingestion anaphylaxis giving rise to arthritis.

A gentleman came to me for his tonsils, which had very distinctly the appearance of chronic infection. He showed at the same time a definite arthritis. My first inclination was to excise the tonsils, hoping that the excision would relieve the arthritis. Before doing so I, at the suggestion of the operative surgeon, tested the patient with various proteids. I got a definite reaction to wheat and potato. These two articles were then omitted from his diet. Within ten days the joint symptoms disappeared. We then put him back on these articles and the joint symptoms reappeared. He then gave these foods up and again the joint symptoms disappeared, and he has been well ever since. I have not seen him for a year, but when I last saw him he was entirely well.

In regard to Dr. Delavan's paper, it seems to me that if we are to select cases for the administration of the *x*-ray and of radium we should probably make a distinction between the lymphoid masses, which are essentially juvenile, and those that are essentially senile or fibrous, because it is not likely that we can produce much change on those lymphoid tissues which are made up chiefly of fibrous elements. The ones that we can influence are chiefly the juvenile. In the senile ones, with evident symptoms resulting from absorption, I question whether we can accomplish so much.

Finally, I think that we should possibly ascribe more importance to the receptivity of the host than to the appearances of the tonsils themselves. Frequently we observe tonsils that are excessively abnormal and yet have no symptoms arising from them; in other instances we find tonsils that are normal, so far as appearances are concerned, and yet, owing to the abnormal receptivity on the part of the host, the removal of these tonsils brings about a striking improvement.

Dr. Joseph H. Bryan, Washington, D. C.:

I should like to relate my experience with the roentgen ray in the treatment of the tonsils and to state that this experience is confined to the use of the *x*-ray. I have not used radium. The bacteriological work in the cases was done by Major Nichols and the pathological by Dr. Merritt, in Washington.

My experience is confined to five or six cases. I will report three of these. Two others are still under observation:

In Case I the patient, a gentleman, was taken ill last September with influenza and then suddenly developed localized pneumonia with endocarditis and nephritis. He was critically ill for a few days and finally overcame the invasion of bacteria, but he had a marked prostration which continued for several months. He was unable even to walk to my office, a distance of three blocks, and had to take a cab. The nephritis continued long after the other complications had cleared up, and while I knew that he had had bad tonsils, it did not appeal to me that they might be the cause of the continued nephritic condition. The tonsils were buried in fibrous tissue and examination of them showed the presence of two kinds of streptococcus, viridans and hemolyticus. The patient received six applications of the *x*-ray and the nephritis cleared up completely, although the bacterial contents of the tonsils remained the same. The organisms were not destroyed. The man was a bad surgical risk and could not have had a tonsillectomy performed under local anesthesia on account of the condition of his throat, and he could not have taken a general anesthetic. I do not know whether the good result in this case was due to opening the crypts and increasing the drainage or to shutting off the lymphatics and preventing invasion of the system by the bacteria from the tonsils, but the case was successful.

In the second case there was marked fibrosis of the tonsils on both sides, with arthritis of the knee. The patient was a woman, aged sixty-five years, who had refused to have the tonsils taken out, and I was glad that she had come to that decision. I had the *x*-ray applied. She had marked Streptococcus hemolyticus infection. There has been no reduction in the amount of tonsil tissue so far as we can tell. There may be in the amount of lymphoid tissue, but the mass as a whole is the same as before and the organisms are as numerous as formerly. I do not believe that any improvement at all occurred.

In the third case the patient was a woman, aged seventy-three years, who had glaucoma. The tonsils were small and soft and contained Streptococcus hemolyticus and viridans. The *x*-ray was applied and the tonsils have been completely absorbed. They were twice the size of a marrowfat pea. The tissue, as I said, has been completely absorbed and the organism has been changed from viridans to hemolyticus. There has been great improvement in her general health and in her eye. We have had remarkable results in this case. I believe that her general health benefit will continue, and the ophthalmologist feels there is a possibility of further improvement to the eye.

Of the other cases I have had one case in a child aged twelve years, who had tonsils and adenoids combined. I am not able to report on that condition yet.

I believe this is a valuable adjunct to our treatment, particularly in selected cases, but I do not believe that it will supplant surgery.

Dr. Cornelius G. Coakley, New York City:

The paper of Dr. Hastings is one that is very difficult to discuss. It is on a line of work in which we ought to do more. About ten years ago I reported before the New York Academy of Medicine the results of our survey of tonsils that we had operated on during the past twelve years (about 146) for rheumatism, and our results were above 85 per cent of very marked improvement or cure. It is very disappointing, especially in a case of acute polyarthritis, to find that some patients will have acute polyarthritis in spite of complete enucleation of the tonsil and as much of the lymphoid tissue as possible.

With reference to the use of the *x*-ray on the tonsil, that is a problem of great interest, and there is not a week goes by that I am not asked my opinion as to the results of this treatment. If there are 55,000 people in New York who need treatment of the tonsil, apparently the *x*-ray is not going to be of much benefit in reducing this number. The actual time of using the ray is three to five minutes, but it has to be repeated from five to seven times. Therefore the total time consumed is certainly more per individual patient than that when surgery is employed.

There is no question that the *x*-ray will reduce the size of the lymphoid tissue. It has been used for years for that purpose in the case of severe lymph nodes in the neck, thymus gland cases and some cases of sarcoma, producing a reduction in the size of the tissue. The question, however, comes up, "What effect will simply reducing the size of the tissue have on the infective material?" The first statement made was that the tonsil was sterilized as the result of this procedure. The Rockefeller Institute cultured the tonsils before and after it and found various organisms before and also afterward. It just happens that three persons so treated, complaining of various so-called rheumatisms, have come under my care. One of these patients I had seen before being *x*-rayed, but I had not cultured the tonsil. I cultured it afterward and found streptococci. The symptoms of none of these patients were in any way ameliorated as the result of the treatment, and they were very bad operative risks. One, a man, aged sixty-five years, with more than 2 per cent of sugar and diacetic acid, did not

have his symptoms a bit relieved. We have had two cases besides these three in which we advocated the use of the *x*-ray in the hope that it would do something for them in the way of reducing the size of the lymphoid tissue and reducing the severity of the symptoms. One was a boy, aged thirteen years, who had had an excellent tonsillectomy but who had numerous lymph nodes on the pharyngeal wall. Before the operation he had had attacks of acute polyarthritis and subsequently he had recurrent attacks. This last winter he was brought to see me and I found that he had numerous scattered lymph nodes on the posterior pharyngeal wall. A thorough investigation was made, but we found no focus of infection anywhere else. These lymph nodes were about the size of a pin's head, red and inflamed, with two small yellow necrotic areas. It was suggested that the *x*-ray be used, and five different treatments, at intervals of two or three weeks, were given. The lymph nodes were reduced perhaps one-third in size, but an examination a few days ago, after the treatment, revealed the fact that there was no greater difference in the size of the lymph nodes than one frequently sees in the rest period between acute exacerbations.

Another boy, ten or eleven years of age, who had a severe mucoid discharge from the nose and nasopharynx, had enlarged lymph nodes. He had had two operations on his mastoid, the latter a radical one, and yet he still had a discharge from the ear. We thought that the discharge was mainly due to a Eustachian tube infection from the nasopharynx. There was lymphoid infiltration, and surgery could do little in the way of removal of the lymphoid tissue, which was embedded in fibrous tissue as the result of the operation. He was *x*-rayed six or seven times. The amount of diminution of tissue on the side of the pharyngeal wall was scarcely perceptible. The discharge from the nose and nasopharynx was not improved. We washed out the sinuses to find out whether he had sinus involvement, and the examination was negative. The discharge from the ear was the only thing improved.

Dr. Delavan was kind enough to let me see the paper of Dr. Murphy. If one will look over the tonsils before and after the *x*-ray of them he will find no great reduction in their size, and I could not see any in which there was entire disappearance of the lymphoid tissue. I think that it will be found out eventually that the *x*-ray or radium will unquestionably reduce the size of the tonsils, but whether it will put the tonsils in such a shape as to free them from infection, especially in the case of small-sized tonsils, I have great doubt.

Dr. Lewis A. Coffin, New York City:

The atmosphere of this morning has been so illuminating that I do not want to sit here and have nothing to say. I want to pay a tribute to our President for his splendid address. Among other things he made us feel small. He made us feel about as small as possible, and made us appreciate what an inconsiderable part we occupy in the medical world, and today we are illustrating it by the fact that we are dealing with a little link in a vicious circle, that is this tonsil business. The trouble seems to be altogether with those tonsils that do not free themselves of pus. Their crypts get full. The size of the tonsil has nothing to do with it. The great big Irish potato tonsils are the least offensive that we have, because their drainage is good. The benefit of the *x*-ray is that it contracts them down and gives the more easily drained sinuses a chance to empty themselves. Dr. Swain does the same thing by splitting them and putting in an antiseptic. It all comes down to the same thing: Can we get elimination?

I do not think that Dr. Bryan's first case proves anything for the *x*-ray. The patient had nephritis and had had five or six treatments. These treatments are not given every day. There were several days elapsing between treatments. We have all had cases of nephritis after scarlet fever or acute tonsillitis that got well without anything except rest in bed and correct diet. That does not prove anything. Get the tonsils out so that you will not get reinfection. We have also to deal with the receptivity of the patient. Dr. Jonathan Wright long ago showed us that in crypts that are backed up by epithelium the infection does not get through. It is the disease in the tonsil after all that causes the trouble; but if you get the crypts all open it is a splendid thing. Are we not going to get to the original cause of the infected tonsil? It is the tonsil that grows so that it does not drain well that is at the root of the matter. The infection gets into the crypts and stays there and forms a special nidus for the growth of bacteria; but what is there back of it in the production of this condition in that particular tonsil?

Here is an experience that I had recently: A young woman came to me and wanted her tonsil taken out. I said, "It does not look as if it needed to come out." She had the degree of lymphoid hypertrophy described by Dr. Murphy, with the enlarged tonsil and the old chronic follicular laryngitis. The tonsil was just one part of this general condition. I said, "Go to the laboratory tomorrow and take a specimen of your urine, and let them get some of your blood for blood chemistry, and then we shall find out what is back of this

trouble." She is an editorial writer for a semi-medical paper, and called me up later and said, "Doctor, I have no time to go into all that." I told her that she might give up a little time for such an important thing, but she replied: "You said it would take an hour a week, and I have not the time. I will have the tonsil out." I have not seen her since. I wanted to save her tonsil if possible and get her better, but she probably went to someone else and I do not know that I shall ever see her again.

Dr. J. Payson Clark, Boston, Mass.:

In connection with the paper of Dr. Hastings, I should like to report briefly a case that I think worth recording, both on account of the age of the patient and on account of the happy result of tonsillectomy. The patient was a woman, aged sixty-nine years, who had had rheumatism in the chief joints with considerable pain. She had had tonsillitis three years in succession, followed by a stiffness in the finger-joints. There were buried tonsils, full of cheesy material, especially in the crypts of the tonsils. In this case the history and the appearance of the tonsils seems to point almost conclusively to their being the source of the trouble, yet in a patient of that age I hesitated to advise tonsillectomy. I referred her to an orthopedist, who gave her a thorough examination and said the arthritis was "of combined origin." He thought the tonsillar element important but advised simple measures first. She went under treatment for several months without improvement. Finally she came back and said she had decided to have the tonsils out. I removed the tonsils May 17, 1918. She had remarkably little trouble afterward. She was able to eat by the next day. I was apprehensive that she might have a great deal of pain and discomfort. The right tonsil was very adherent. She went to the country May 19 and I got a letter on May 24 saying that she had had no more pain in the joints, but that they were still stiff. This chronic process had been going on for so many years that there were changes in the joints that could not be relieved by operation. Two years afterward she said that she was free from pain, could walk with more ease, and that she was much pleased with the result of the operation.

With regard to Dr. Swain's paper, slitting the tonsils, of course, is a procedure which has been successful in the hands of many of us. He did not speak of the use of suction on the crypts, which I think a valuable treatment in suitable cases. I should like to report briefly, also, a case of that sort which shows very conclusively the definite

results of suction. This was in a woman, aged thirty-eight years, whom I saw first in April, 1916. She had been having a great deal of rheumatism—muscular rheumatism—all through the winter. The cheesy material was cleaned out from the crypts of both tonsils. She objected very much to tonsillectomy, and I should not have advised it without trying other methods. She was freed from rheumatism because the symptoms disappeared two days after the treatment. I did not see her until a year and a half afterward. She had been having rheumatism. The tonsils were cleaned out again, with the same result. I saw her again in November, 1918. She had been having rheumatism again, and I followed the same procedure, with the same results. In April, 1919, I cleaned the tonsils out with the suction apparatus and had the same result. She had been free from rheumatism since April, 1919, until recently, when she had some rheumatism. I cleaned out the crypts again and she has had no rheumatism since.

Dr. Charles W. Richardson, Washington, D. C.:

I do not think that what I have to say comes under the caption of "something new," but I have something to suggest, and I should like Dr. Delavan to tell us about it. We know that in all cases of destruction of lymphatic tissue in the fauces, especially where it is not delimited, there is a tendency to dryness of the mouth and throat. Even with ordinary tonsillectomies there is a certain amount of dryness resulting in a certain percentage of cases. All forms of new treatment pass through a stage of enthusiasm, a stage of criticism and a stage of hostility. Is that going to ensue with this type of work, *x*-ray and radium? There is no doubt that the *x*-ray and radium will destroy lymphatic tissue, but is it not possible that in this destruction we shall have ill results—not in a year, but in some later period? Unless the area is delimited to a large extent, shall we not have ill results ensuing from the destruction of too much lymphatic tissue? Anything in the world that will limit the activity of the militant march of the tonsillectomist will be acceptable to most of us.

Dr. Harmon Smith, New York City:

Having listened to the discussion I feel entitled to say one word. I will omit answering Dr. Swain and Dr. Hastings and confine what I have to say to the *x*-ray and radium. We all know that in the application of both treatments they benefit a malignant tumor by the production of endarteritis. The application does not destroy the

tumor—it shuts off the blood supply and shrinks down the mass. When we cut off the blood supply, the diseased tissue shrinks in due course of time, but Nature establishes a new blood supply of more lasting character and the tumor begins to grow again. When in the application of raying it does not destroy the lymphatic tissue, but shuts off the blood supply to the lymphatic channels, the tissue shrinks. When the blood supply begins to reëstablish itself, as it will if the patients live long enough, you will have increased growth of the mass.

Dr. John R. Winslow, Baltimore, Md.:

There is one point that has not been brought out. I think that it has been well established that the *x*-ray and radium will destroy tissue, lymphoid tissue included; radium has been used for that purpose. What proof have we that it will not destroy more important structures in the neighborhood. If it will destroy these structures why will it not destroy the important endocrine structures—the parathyroids for instance? In applying the *x*-ray to the nasal pharynx I think there is a possibility of the production of a meningitis. In fact this has occurred in the treatment of tumors in this region with radium. These are two points that I should like to present to you. In the treatment of comparatively simple hypertrophy, such as that of tonsils and of adenoids, I do not think that the time element is so much reduced or that the safety is much greater as compared with surgery.

Dr. Hastings (closing):

I had no delusion that I had anything to present here to add to the work as a laryngologist, but I made up my mind several years ago that I would study my tonsil cases better before operating on my patients. I do not think that it is necessary to be a member of a group to do this. I had a feeling that private practice statistics were more valuable than hospital statistics, because you were dealing with people of more intelligence. I felt that I should like to give in this paper records of five or six years of study for this reason: I feel there is a need out West (and I think in the East also) for laryngologists to take a more determined stand in the study of our tonsil cases. We should study them thoroughly before deciding for or against operation. It would be interesting to study those in which we did not operate to see what happened. It would be interesting to study cardiovascular cases; but each is a problem in itself. I feel that being permitted to present

this paper to this Association—although I felt that it was something that you knew more of than I did—is a great privilege, because I felt that such a report with the backing of this Association would show to the thousand or more laryngologists in the country that while there is no question that tonsillectomy does do good in picked cases it does not always do so, and that there must be group study work in every case.

In regard to Dr. Delavan's remarks, I would say that I am interested in his study of lymphoid tissue in the pharyngeal wall after tonsillectomy. I have been annoyed by finding this in some children and young adults and not knowing what is best to do.

Dr. Goodale asked whether there had been anaphylactic reactions noticed in the uncured cases of my tonsil series. My attention was not brought to it. In the case that starved twenty-six days with definite decrease in the rheumatism, I wonder whether food anaphylaxis was not a factor. We see rheumatic patients out West that have been eating grapefruit and oranges to excess, and that is possibly a food anaphylaxis.

Dr. Delavan (closing):

The thesis just presented was prepared at the request of the President of the Association, who desired that the subject of the treatment of diseased tonsils by *x*-ray and radium be brought before the Association for explanation and discussion. My object has been to record the latest facts and theories pertaining to it, not yet venturing positive opinions of my own. In the present stage of the investigation it would seem that our attitude should be one of receptivity. This seems to have been submerged in a wave of rather premature objection. My intention has been to present the subject with as much conservatism as possible and to indicate the conditions in which it is probably beneficial. By no means all of the propositions regarding the use of radium in this connection have been scientifically established. Much more must be learned and proved before the method can be accepted as effective and safe. One fact, however, seems to have been definitely demonstrated—namely, that radium exerts a powerful influence upon lymphoid tissue even when applied in very small doses. It has also been proved that there are certain other things which it will not do. One of these is to reduce fibrous tissue. Another is to destroy the activity of septic germs. By so much at least its value in the treatment of the tonsils is negative. In certain other conditions referred to in the paper the success of its application seems fully to warrant more extended investigation. The worth of the method is being scientifi-

cally tested in the best hands. When the tests have been carried on for a sufficient length of time we shall know more about the subject. At present the situation is tentative.

Dr. Swain (closing):

Whether I can come up to the masterly form of closing I do not know, but after the touching description that our President gave of the twilight of laryngology it occurs to me that perhaps part of it is due to the inaccuracy of our work in this line. I have often felt that I did not want to jeopardize the health or perhaps the life of a patient or even the integrity of the parts of the throat merely to settle the question whether the tonsil was or was not a cause of trouble. I have worked a good deal on what I have presented to you. It has been accurately done, so that I am able to assure you that the details have been carefully gone over. With this and several other methods already carefully and thoroughly described it would seem to me that when one desires to eliminate the tonsil as a cause of systemic trouble it can be done without always resorting to tonsillectomy.

I am glad to be in the very good company of Dr. Goodale and Dr. Delavan, when I insist that we may not hope to change a sclerosed tonsil; and I agree with what is evident in the history of one of the cases presented by Dr. Hastings that we must remember that we have twenty-six feet of intestine, of which the tonsil is only the beginning.

VENTRICULOCORDECTOMY: A NEW OPERATION FOR THE CURE OF GOITROUS PARALYTIC LARYNGEAL STENOSIS

CHEVALIER JACKSON, M.D.

The literature of laryngeal stenosis is so burdened by the premature reports of cases that the author has waited for the lapse of time to prove the permanency of what he believes to be an ideal operation for the cure of that form of stenosis associated with bilateral recurrent paralysis when the stenosis is due solely to the paralysis. In these cases tracheotomy has usually been already done for urgent dyspnea and the patient comes to the laryngologist for decannulation.

Previously Devised Operations. The ideal operation would, of course, be the neuroplastic reconstruction of nerve continuity by resection and anastomosis, with or without transplantation. Obviously this procedure would be limited to peripheral cervical lesions. It would be impracticable in laryngeal paralysis due to central or mediastinal lesions. It has been done with an excellent result in a case of monolateral paralysis by J. Shelton Horsley and Clifton M. Miller.[1] Neuroplastic surgery directed to anastomosis of the recurrent with the pneumogastric may yet be demonstrated as useful. Any procedure designed to restore motility must be done within a year of the complete loss of abduction, because after a certain period, usually only a few months, loss of motility is followed by neural and muscular atrophy, after which resumption of motion even with nerve continuity becomes hopeless. Complete recurrent paralysis evidenced by a cadaveric position of the cords renders it hopeless to expect any motility; but in most of these cases the stenosis has been relieved by the greater glottic area afforded. This has led to attempts at creating the cadaveric position by section of the recurrent nerves. This has been disappointing in not creating the desired cordal position. Extirpation

of a section of the nerve in one case suggested by the author was followed by the cadaveric position; but, as is usual in all cases with this state of the larynx, expectoration is very imperfect and in tracheobronchial or pulmonary sequelar or intercurrent conditions the patient may even drown in his own secretions, as pointed out by the author.[2 7]

Endoscopic evisceration[2] is quite effectual in relieving the stenosis and readily brings about decannulation, but its expectorative and vocal results are not as good as those of ventriculocordectomy.

Laryngostomy is very effectual in restoring oronasal breathing, and the expectorative and vocal results are usually good; but there is not in paralytic cases the necessity for the prolonged period of aftercare that exists in the cases of cicatricial laryngeal stenosis. When, however, the paralytic stenosis is complicated by cicatrices, as for instance from a high tracheotomy, the operation of laryngostomy may be necessary; but even here the cicatricial part of the trouble, if not too extensive, may, in many cases, yield to bouginage after ventriculocordectomy has removed the cordal obstruction.

Bouginage has no effect whatever on paralytic stenosis, the cords freely separating to admit the bougie and promptly collapsing on its withdrawal, like "making a hole in water."

Intubation has no permanent effect on the stenosis, but is often suggested as a substitute for tracheotomy for the relief of the dyspnea in abductor paralysis. Such use is, however, exceedingly dangerous because of the probability of an asphyxiating dyspnea should the tube be coughed out in the absence of an expert intubator to replace it.

Cordectomy, the excision simply of the cord, has been tried and found unsatisfactory by Gleitsman and others. I have had success with it only in very few cases. These were done many years ago, and I now feel that the successful cases included more tissue than the cord alone, and were in fact a ventriculocordectomy imperfect and incomplete because of the difficult method of work with the mirror or through the Kirstein autoscope. So far as the latter instrument is concerned, possibly the results in this and other operations might have been better if used with the since-acquired technic and manipulative experience.

Dyspnea in Bilateral Recurrent Paralysis. This is due, of course, mainly to the paralysis of the cricoarytenoidei postici, but there is another factor which I believe I was the first to point out. It is a purely mechanical one, due to the shape of the ridge of tissue supporting the cord and forming the floor of the ventricle. The tapering shape of the subglottic airway (Fig. 1) encountered by the upward moving expiratory blast widens the flaccid glottic margins; whereas the flat floor of the ventricles is depressed, throwing the cordal edges together and thus tending to close the glottis tighter. The more sudden and strenuous the effort to inspire

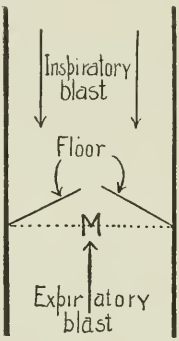

Fig. 1.—Schema illustrating the tight closure of the glottic chink by the inspiratory blast in bilateral abductor paralysis, on the mechanical principle of a check-valve. The expiratory blast opens the glottic chink wider. During inspiration, pressure on the ventricular floor narrows or even tightly closes the chink.

the quicker and tighter the closure. This is one of the chief reasons why the patient's distress is less the more quietly he breathes; whereas panic and strenuous efforts lessen the actual amount of air he can pull through his glottis. It seems quite likely that a portion of the good results obtained by ventriculocordectomy are due to the alteration in the shape of this ridge of tissues at each side of the glottis. Exactly what the cross-sectional shape is after cure by this operation I have not yet been able to demonstrate, because there has as yet been no opportunity to obtain a post-mortem in any of the cases; but judging by the laryngoscopic

appearances the flat floor of the ventricle is replaced by a sloping wall and the cross-section is probably similar to Fig. 2.

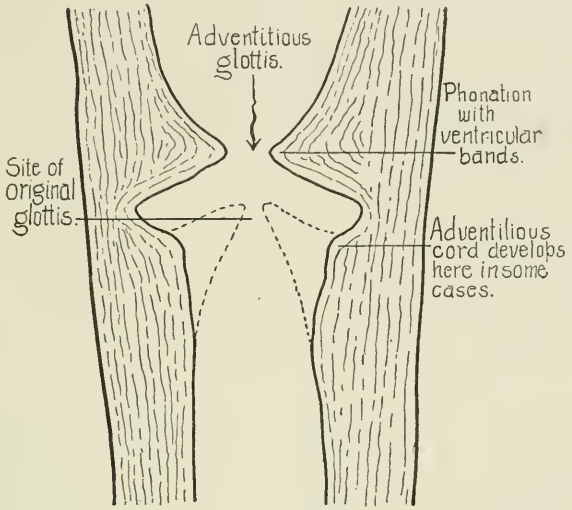

Fig. 2.—Schema showing probable coronal cross-section of larynx after ventriculocordectomy, judging by appearances on mirror examination in cases in which there was no formation of an adventitious cord.

Bilateral Abductor Paralysis Due to Goiter. Most of the cases of bilateral laryngeal paralysis of peripheral origin that have come to the bronchoscopic clinic have been due to goiter. Very rarely has the paralysis been the result of the thyroidectomy. Usually laryngeal motor trouble has been present before operation, though not always detected because of the larynx not having been examined. In quite a number of cases the history proved this. In other cases the recurrent paralysis came on long after the thyroidectomy. In both classes of cases the author has been able to protect the surgeon by careful analysis of the history. The necessity for an examination of the larynx before every goiter operation, first strongly urged by the author, is now quite generally recognized.

Vocal, Protective and Expectorative Results of Ventriculocordectomy. The three chief functions of the larynx are

phonation, protection and expectoration. Any laryngeal operation proposed must be considered in its results on these three functions. In all of the 7 selected cases operated upon by this method a voice louder than an ordinary whisper has been obtained. In 4 cases the voice has been loud enough to be heard across a large room. Including these 4 there have been, altogether, 6 cases that had loud enough voice to carry on ordinary conversation in a reasonably quiet room. The voice while rough and of "stage-whisper" quality in some, in others was smoother but deep in pitch. In the latter group of cases the ventricular bands took on the function of the vocal cords. This vicarious functioning of the ventricular bands is quite regularly seen in other than paralytic conditions, often having in such cases the full approximating excursions of a pair of true vocal cords, though lacking tension and thinness the voice is usually deep and rough. In the class of cases now under consideration, being paralytic, full active excursion was not to be expected; yet an unexpected degree of approximation of the ventricular bands was present during forced phonation, possibly from the partial action of muscles to which unparalyzed filaments of the recurrents functioned, chiefly the cricoarytenoideus lateralis, or to external accessory muscles not innervated by the recurrent nerve. One pair of muscles that was palpably active in most of the cases was the cricothyroidei. The arytenoid cartilages in all of the cases certainly showed some degree of rotation on the cricoarytenoid joint, whatever may have been the muscular mechanism. In 2 cases the motion was so nearly normal in range, and the adventitious cords so nearly resembled normal cords that it would have been difficult without the history to realize that an abductor paralysis had been present and that the normal cords and their support had been excised. In these cases on theoretical grounds I assumed that the cricoarytenoideus lateralis had retained full functional activity, dragging out and forming an adventitious cord from the cicatricial tissue that resulted from the ventriculocordectomy, just as happens so often after thyrotomic excision for cancer. (Fig. 3). On theoretical grounds I have assumed that by excising the cordal tissues that can no longer be pulled out of the way because of the paralysis of the cricoarytenoideus posticus we substitute the elasticity of a scar for the activity of the paralyzed muscle,

the elasticity producing the abduction while the still active cricoarytenoideus lateralis produces the adduction, just as in the common mechanical reciprocal movement, positive forward with spring return. The only evidence against this theory is that we would expect a certain percentage of the cases to show a later loss of motility of the ventricular bands or adventitious cords due to the subsequent paralysis of the cricoarytenoideus lateralis; and this did not occur. Whether or not this series of cases happened to include no case of later paralysis of the cricoarytenoideus lateralis it is impossible to say. So far as the ventricular bands are concerned it is by no means clear that a large part of their vicarious motility may not have been due to the drag of a muscular synergistic combination of which the cricoarytenoideus lateralis is not a part. To what extent a movement of the thyroid and cricoid

Fig. 3.—Schematic representation of the author's theory of development of an adventitious cord.

cartilages, one upon the other, contributed to the result I have been unable to determine. There is certainly a difference in the laryngoscopic postoperative appearance of the cases here reported as compared to what I have ventured to call the "wooden" appearance of the parodoxical "living cadaveric" larynx. Part of this difference consists in the squeezing together of the upper laryngeal orifice in the ventriculocordectomized larynx. The degree of this "orbicular narrowing," as I have ventured to call it, is probably dependent somewhat upon the degree to which the arytenoideus is innervated by the superior laryngeal nerve. The participation of this nerve in the motility is probably subject to wide individual variations, participating largely in some, not at all in others. The superior laryngeal seemed not to be implicated in any of the cases in the series on which this article is based.

Leaving all these theoretical considerations for future determination there can be no question as to the clinical fact that the phonetic, protective and expectorative condition of the patient is very much better than that of patients whose recurrent paralysis has reached the complete stage known as cadaveric. In view of this clinical fact, though founded on only seven cases, it becomes a question whether or not it is advisable to delay after it is clear that the cricoarytenoideus posticus is not going to resume its function.

Cases Suitable for Ventriculocordectomy. In any operation innumerable failures to get satisfactory results follow the operation upon unsuitable cases. To this rule ventriculocordectomy is no exception. It cannot be too emphatically stated that if success is expected from ventriculocordectomy alone its doing *must be limited to cases totally free from cicatricial stenosis.* At first thought it might be considered strange that cicatricial stenosis could occur in case of true laryngeal paralysis. But it must be remembered that bilateral laryngeal paralysis usually occasions such a severe degree of dyspnea that tracheotomy is required, and unfortunately, as first pointed out by the author,[1] tracheotomy is usually done too high, hence a paralytic stenosis is usually followed by a cicatricial stenosis, due to inflammatory reaction, perichondritis, chondrial necrosis, division of the cricoid cartilage, etc.[2] The latter error is little short of a calamity. Not infrequently the tracheotomy is in reality a laryngotomy and the tracheotomic cannula is actually inserted through the larynx.[4] In many cases of laryngeal stenosis that have come to the bronchoscopic clinic the cannula could be seen, by mirror laryngoscopy, lying between the cords, in a few even above the cords.[4] Our only concern with these matters here is to state that while the new operation of ventriculocordectomy may get a good result in a few such cases the success obtained by the author in seven cases in which there was no stenosis whatever save that due to the cord and its support has led him to the decision to apply the operation only to those cases of laryngeal paralysis in which a full-sized bronchoscope can be passed readily through the larynx and down to the carina. If future operators will follow this test in the selection of the cases and follow the author's technic before attempting

deviations therefrom, I feel sure they will get the same satisfactory results. In the selection of cases, naturally the recent cases, having some hope of recovery of laryngeal motility would be excluded. Patients with only a moderate degree of dyspnea because of their paralysis being monolateral in most cases had best wait the possible involvement of the other cord. During the waiting period they should, of course, be in close touch with a tracheotomist for the emergency. The usually moderate degree of dyspnea present when the cords have assumed the cadaveric position of complete paralysis usually does not call for relief of laryngeal stenosis, unless of a cicatricial type due to errors in tracheotomy or its after-care. Patients in whom but one cord at a time has been paralyzed and assumed the cadaveric position, present themselves with a bilateral cadaveric cordal position without ever having had a tracheotomy. In such cases if the area of the glottis is insufficient it may be increased by ventriculocordectomy on one or both sides. The operation is particularly adapted to the cases of laryngeal abductor paralysis following goiter or goiter operations, because these patients have usually a long expectancy of life. The same is true of cases resulting from benign neoplasms. In tabes and disseminated sclerosis the expectancy may or may not be long according to the stage of the disease at which the paralysis appears in the bilateral form. Decision as to whether or not operation is worth while in such cases must rest upon this and upon the patient's feeling in the matter after the situation is stated to him. Ventriculocordectomy has the advantage over all other operations that it is relatively quite a minor one, with no prolonged after-treatment, hence it would seem well worth while in those early-discovered cases of tabes and disseminated sclerosis in which the laryngeal paralysis is a distance signal years ahead of the serious stages of the disease. In cases of aneurysm the same principles apply. In tumors and other intracranial lesions of grave prognosis, of course, no operation for decannulation is worth while.

Contra-indications. Recency of the onset of the paralysis is a contra-indication. Until a year has elapsed we cannot be sure that at least a degree of motility will not reappear. Such recovery is rare after six months and probably never occurs in cases in which there is no sign of returning motility after the lapse of a year.

The advisability of waiting applies to adults and with even more force to children. In the latter I believe it justifiable to wait a year and a half or even two years. If the tracheotomy has been done sufficiently low (below the second ring) and a daily toilet of the wound be carried out there will be nothing lost by so long a wait. If the tracheotomy has been too high, as is almost always the case,[4] a second tracheotomy should be done down at the proper place and the fistula of the faulty high tracheotomy allowed to heal. Then there will be nothing lost by a wait of two years. Most of the spontaneous recoveries have been in children. George L. Richards reports an especially interesting case of this kind.[5] I have incomplete notes of 11 such cases that came to the bronchoscopic clinic. Of these 8 were congenital. Of the latter 4 were due to enlarged thymus gland, congenital goiter and mediastinal conditions. The thymic cases recovered following diminution of the bulk of the gland by roentgen-ray therapy. One case was due to unknown causes. The other 3 I thought were due to injury of the recurrents in the neck during instrumental delivery. Two of these recovered cordal movement some months after tracheotomy.

Cases in Which the Cricoid has been Divided. It is a great misfortune that treacheotomy is almost always badly done. One of the most frequent errors is the division of the cricoid cartilage.[4] This altogether unnecessary and calamitous fault cannot be too strongly or too frequently condemned. The other cases in which the cricoid cartilage has been cut are those that reached the bronchoscopic clinic after a thyrotomic attempt had been elsewhere made to relieve the stenosis. In these, also, cutting of the cricoid was a mistake. The cricoid is the only complete ring in the air passages, and it is like the steel-tube casing in a tunnel in maintaining the full extent of all transverse diameters. When it is divided, and especially when necrosis has shortened its perimeter, diminution of the lumen is inevitable not only from the concentric pressure of the surrounding tissues, but even more from the contraction of the internal and external cicatrices that have resulted from the faulty surgery.

Preliminary Exclusion of Curable Lues. This is not required in two classes of cases:

1. Those in which there is a cadaveric position of the cords. In such cases resumption of motility never occurs in my experience. The cadaveric position in most cases gives air enough so that relief of stenosis is not often imperatively demanded unless cicatricial stenosis has been added by high tracheotomy.

2. Those in which there is an obvious peripheral lesion, such as a goiter or other tumor, or in which there is a history of onset after a cervical operation. In all other cases, notwithstanding negative histories and negative Wassermann tests, a thorough course of protoiodide of mercury of two months' duration should precede decision to operate, the patient being kept "saturated" just under the point of ptyalism. In cases in which there is no laryngeal inflammation there is not the contra-indication to potassium iodide that usually exists in laryngeal lesions; and there is a clear indication for its administration in addition to, but not to the exclusion of, the mercurial.

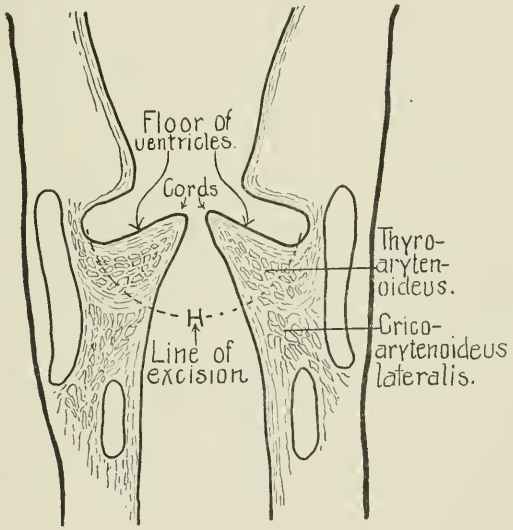

Fig. 4.—Schematic drawing of coronal section of the larynx showing the tissues removed in ventriculocordectomy.

The Anatomical Structures Sacrificed in Ventriculocordectomy, while very important to a normal larynx, are of

little importance in the hopelessly paralyzed larynx. They may be considered under two heads, namely, the cord and the supporting tissue of the cord (Fig. 4). The cord proper, which consists of elastic tissue, is by its vibration the chief factor in normal phonation. The loss of one cord in monolateral ventriculocordectomy was followed by huskiness but not complete aphonia, even temporarily, except in 1 case that quickly recovered a husky voice. In 2 cases the monolateral operation gave the patient almost sufficient airway, but for greater comfort and to allow a margin of safety during any future intercurrent acute laryngitis the other side was operated upon also. In all cases the operation was done first on one side, then, after healing, on the other. The most important element in the supporting tissue of the cord is the thyroarytenoid muscle. As this muscle is, in the normal larynx, of use only as a tensor or relaxor, or, as I have thought, a nodal regulator of tension, its function concerns not so much the mere production of sound as the refinements of pitch and quality of tone. Furthermore, when we consider that it is usually paralyzed when we have a paralysis of the cricoarytenoideus posticus the usefulness of the thyroarytenoideus narrows down to the support its bulk affords for the cord; and as this bulk is the chief element in protruding the cord into the airway of the larynx it becomes an element in the obstruction. When the completely paralyzed state known as a cadaveric paralysis is reached its bulk is probably more or less diminished by atrophy; but these cadaveric cases are not the cases in which ventriculocordectomy is called for. The other muscular structures in the operated region, the cricothyroideus and the cricoarytenoideus lateralis, are located so far externally and are so protected by the cartilages that with a little care and the use of the forceps shown in Fig. 5, they are unharmed in the operation. It has seemed to me quite essential that they be left intact, and especially is this true of the cricothyroideus as it is innervated by the superior laryngeal, and hence its motility is unimpaired. With the cords gone the importance of its functional activity might be questioned if it were not for the fact that in spite of an undoubted stenotic recurrent paralysis of long standing the tissues remaining in the larynx after ventriculocordectomy do show a certain amount of movement on "phonation" or

attempts thereat, and the value of the postoperative vocal results seems to be more or less proportionate to the degree of movement. While this movement cannot be clearly demonstrated to be due to the activity of the cricothyroideus, this muscle can be distinctly felt to swell during forcible efforts at phonation; and, moreover, it is logical to preserve every unparalyzed muscle, regardless of the more or less theoretical nature of its function in the normal larynx. For these reasons also it has seemed to me that the cricoarytenoideus lateralis had better not be injured notwithstanding the fact that, on theoretical grounds, it might be argued that as it is the unopposed action of this muscle that causes the stenosis when its antagonist is paralyzed there would be the same advantage in destroying it as accrues from the cadaveric state of the cord when the paralysis has reached the complete stage. Moreover, it has seemed to me, as elsewhere herein mentioned, that the resiliency of the scar tissue at the site of the excised cordal tissues furnished the reciprocal return after relaxation of the tonic contraction of the cricoarytenoideus lateralis (Fig. 3). One cannot close a shut door. The glottis remaining closed gives little work for the lateralis to do; but if a spring-like action of the scar-tissue tends to pull the glottis open, as I believe it does, the cricoarytenoideus lateralis has work to do that keeps it from atrophy; and the hundreds of pulls daily drag out, in time, an adventitious cord.

Technic. No anesthetic, general or local, was used in children. In adults cocain was painted on with a swab and a sedative of morphin, gr. $\frac{1}{4}$, was given hypodermically an hour before operation.

The larynx was exposed with the direct laryngoscope and through it the punch forceps were inserted. The ventricular band was elevated and the forceps applied as shown in Fig. 5. Thus the floor of the ventricle and part of the mucosa of its outer wall were removed at one clip. A clean cut is necessary. The tissues must not be hacked. In some cases the ventricular bands were in tight opposition, so that the forceps were insinuated between them before expanding the jaws. Great care should be taken to avoid getting too far outward between the thyroid and cricoid cartilages lest the cricoarytenoideus lateralis be injured. With the forceps used this accident is easily avoided. Great care should also be taken not to excise any part of the arytenoid cartilage.

The clipping off of the extreme tip of the vocal process of the arytenoid was necessary in some of the cases because of the shortness

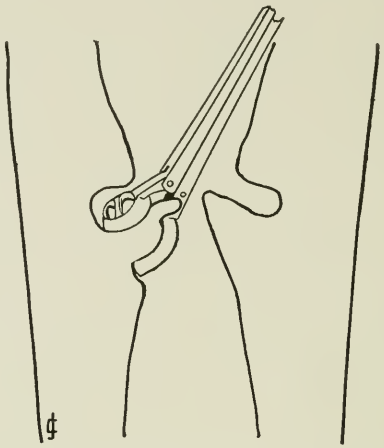

Fig. 5.—Technic of ventriculocordectomy. The ventricular band is elevated and the forceps are applied beneath it to the cord and the entire ventricular floor anterior to the vocal process and antero-external surface of the arytenoid. The tissues are excised at one clip.

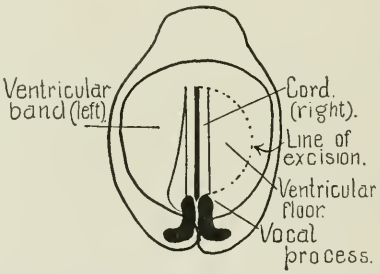

Fig. 6.—Schematic drawing of tissues removed in ventriculocordectomy, as could be seen through the direct laryngoscope (recumbent patient) if the ventricular band did not obscure the view of the ventricular floor. The removal is in rounded form and anterior to the vocal process. After healing of one side the other side is similarly operated upon.

of the cord; but the excision of more than this is unnecessary and should be avoided. It may not be amiss here to state that,

judging from experience in postgraduate teaching at the bronchoscopic clinic, few laryngologists seem to realize how far the vocal process of the arytenoid projects forward toward the anterior commissure.

The technic is so simple in theory that it can be understood from the illustrations (Figs. 4, 5 and 6). To perform the operation, however, requires education of the eye and the fingers in endoscopic technic. Of course the excision of the cord and the ventricular floor can be done by laryngofissure; but here we have, though not a serious operation, yet one that will appear much more formidable to the patient. I have always found patients glad that it is "unnecessary to go in through the neck." The assurance of an operation through the mouth, one that is no more disagreeable than having a tooth filled and one that will not require more than a minute, appeals strongly to the patient. Facility in direct laryngeal operating will enable the utmost accuracy of excision.

No after-treatment is necessary. The surface of the wound is covered with an exudate under which healing by granulation progresses. In one case a granuloma appeared at the site of the wound and excision was done lest it later lessen the lumen of the airway. In two cases a slight degree of perichondritis was present after the excision of the second cord and ventricular floor; but it subsided spontaneously in about a month. In one case the lumen of the airway was not quite sufficient and prolonged treatment with the McKee divulsor was necessary to increase it. Bouginage can be used for this purpose after ventriculocordectomy, though it or any other form of dilatation is useless before removal of the obstructive cord and its supporting tissues.

The Duration of the Operation. Done endoscopically, on one side only, was never over one minute in any case, not counting the time required to paint on the cocain solution. The healing has not required more than three weeks in any case, and in some cases healing was completed in ten days. In some cases recurrent formation of granulomata had to be combated by excision and delayed for a number of months the operation on the other cord.

Decannulation is by the author's system of corking. When the laryngeal airway seems ample the partial corking of the

cannula is commenced.[2] Ordinary corks, either of bark or rubber, are friable and involve risk of aspiration of fragments. A chemist's cork of good rubber with a central perforation is sometimes obtainable to fit an adult cannula; but for general use it is better to get what is known to the rubber trade as "pure cord" of suitable diameter, and from this to grind a proper cork on an emery wheel. One side is ground off flat or grooved to permit leakage of air past the cork to the desired degree.[6] At the bronchoscopic clinic we usually start with a "half-cork." New corks are then made from time to time with less and less by-passage space until a "whole cork" completely occluding the cannula can be worn night and day. The cork is worn in the outer cannula and for convenience the cork has a braided silk tether to prevent loss. With a proper cannula there is plenty of room around it in the trachea for the air to pass upward to the larynx without the very objectionable fenestrum. The cannula should not be abandoned until after the patient has been able to wear a "full-cork" night and day for a month. Parenthetically it may be stated the cork is frequently removed for cleansing and the cannula is replaced by its sterilized duplicate daily. The daily toilet of a tracheotomic cannulated fistula is necessary not only for decent cleanliness, but to prevent irritation and inflammatory thickening with inevitable subsequent cicatricial contraction.

Plastic Closure of the Tracheotomic Fistula. If in six months after decannulation a fistula remain open and the laryngeal lumen is ample the fistula may be closed by a plastic operation if the patient so desires. After having worn a tracheotomic cannula for a long time the fistula has a firm cicatricial wall with more or less epithelialized surfaces that will not unite, though contraction of the cicatricial walls usually narrows the lumen until the leakage of air and secretions is trivial. Of the many plans of closure none is so simple and effective as that shown in Fig. 7. The fistula is dissected free in tube-like form, drawn out, ligated close to the trachea and cut off to a very short stump, which may be touched with pure carbolic acid. The soft tissues are then drawn together over the stump with deep sutures and the skin wound is sutured close without drainage. Primary union is to be expected and only rarely will the wound open and leakage be reëstablished. In the latter case re-operation will be effective.

Mortality and Results. In the series of eighteen cases of bilateral recurrent paralysis in which I did an endoscopic ventriculocordectomy there was no operative mortality and no later mortality. All were ultimately relieved of dyspnea. The vocal, protective and expectorative results are considered above.

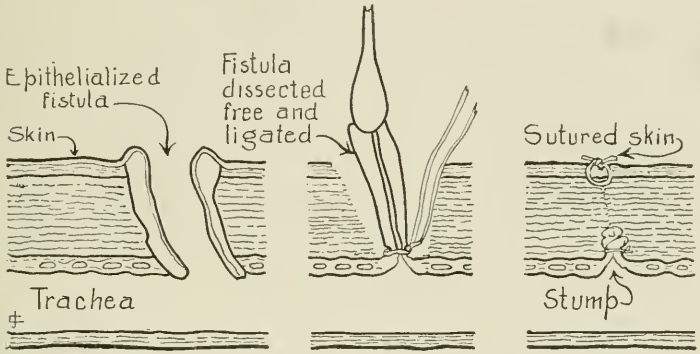

Fig. 7.—Plastic operation for closing of a tracheotomic fistula.

Report of Cases. In 11 of the 18 cases in which I did ventriculocordectomy the operation failed to restore an ample lumen and the operation had to be supplemented by other means —bouginage, laryngostomy or intubation—because the paralytic stenosis had been complicated by a cicatricial stenosis due to high tracheotomy, faulty after-care, improperly shaped or fenestrated cannulæ, etc. It would be misleading to report these as failures of ventriculocordectomy, inasmuch as they were, as I learned, not the kind of case in which to expect a cure by this operation alone. In view of this, and considering the space saved, it seems best for illustrative purposes to report here only those cases to which the operation was suitable.

Case I. *Bilateral Recurrent Paralysis Due to Goiter.* Woman, aged thirty-one years. Goiter removed two years prior to admission. Said to have been in imminent danger of asphyxia on the operating table. Severe dyspnea required tracheotomy the night after operation. No laryngoscopic examination had been made before operation. On admission to the bronchoscopic clinic for decannulation, mirror exami-

nation revealed not the slightest abduction on inspiration, but there was a slight flutter of the arytenoids on attempted phonation. This I thought might be due to retention of some degree of innervation of the cricoarytenoideus lateralis and thyroarytenoideus. I therefore advised waiting in the hope of resumption of function of the cricoarytenoideus posticus. After a year the conditions in the larynx were precisely the same, the flutter being of about the same degree, and there seemed no progress toward complete or cadaveric paralysis. The cricothyroideus could be felt contracting on forced attempts at phonation. Bronchoscopy revealed no obstruction other than the paralyzed cords. Ventriculocordectomy was done, first on one side and then on the other, three weeks intervening. Patient decannulated six months later and a plastic operation was done to close the fistula. The voice was a loud "stage whisper." There was no return of the stenosis one year after operation, but the voice had not improved beyond the "stage whisper." The cricothyroideus could be felt powerfully contracting on attempted phonation.

Case II. *Bilateral Recurrent Paralysis Due to Goiter.* Woman, aged thirty-two years. Removal of a goiter two years before admission had failed to restore movement to the cords. The patient was sent in for decannulation. Mirror examination showed the true cords almost motionless in the median line. Phonation was excellent, but seemed to be deepened in pitch by the failure of perfect tension and approximation, one being slightly above the other. The ventricular bands had a degree of movement which led me to advise waiting at least a year in the hope that abduction of the cords might in some degree return. At the end of fourteen months not the slightest improvement of motility was noticeable in the true cords; the movement in the ventricular bands was, if anything, rather less. Bronchoscopy excluded cicatricial stenosis. Ventriculocordectomy enabled me to decannulate this patient with a good vocal result and a cure of the stenosis that was still satisfactory to the patient when last seen one year after operation. A pair of adventitious bands with fairly good movements had appeared at about the level of the original cords. The laryngeal function in cough and expectoration seemed good during an intercurrent acute tracheobronchitis.

Case III. *Bilateral Abductor Laryngeal Paralysis Due to Goiter.* Woman, aged forty-two years, had suffered from severe dyspnea that had come on suddenly eighteen months before. Tracheotomy had

been done by a general surgeon at that time, and shortly thereafter he did a thyroidectomy for a large retrotracheal goiter. The laryngeal stenosis continuing the patient was referred to me for decannulation. Mirror examination showed both cords incapable of abduction, but remaining separated about 1 mm. On phonation they would approximate and emit a fairly loud sound of rather deep register and rough quality. A 9 mm. bronchoscope was passed through the larynx and down to the tracheal bifurcation without encountering any abnormal resistance. Ventriculocordectomy was done on the right side through the direct laryngoscope after applying to the larynx one swab moistened with 10 per cent. cocain solution. Two months later the same operation was done on the left side. The first operation enabled the patient to wear a "half-cork;" the second operation after the lapse of four weeks allowed the patient to wear the tracheotomic cannula completely corked when sleeping or when going about slowly. At the end of one year the narrowest part of the laryngeal airway was even wider than when discharged, and she had a voice quite as loud as before the laryngeal operation. The pitch was much deeper. Phonation was with the ventricular bands. When last seen, five years later, the laryngeal stenosis had not recurred. The cannula had been abandoned. A slight fistula remained, but the patient declined to have me do a plastic operation for closure.

Case IV. *Paralytic Laryngeal Stenosis, Cause Unknown.* Man, aged thirty-eight years. Admitted suffering with extreme dyspnea. All of his time and attention had to be given to voluntarily controlled breathing, so that he could neither eat nor sleep. Any attempt at deep or quick inspiration prevented any air from entering. Low tracheotomy was done by me immediately. The cords were in close approximation. Careful study and observation of this case by internists and roentgenologists extending over two years' time failed to discover any cause for the abductor paralysis. No sign or symptom of any peripheral or central lesion could be discovered. Ventriculocordectomy was done on one side, then on the other two months later. A good but very deep voice resulted. Phonation was with the ventricular bands, the movement on phonation being a narrowing of the whole upper laryngeal orifice with close approximation of the free edges of the ventricular bands. When about to speak the patient always dropped the head and neck slightly downward to one side, and the muscles of the whole neck seemed to be contracted. At the end of two years after operation there was no return of the stenosis and the cause of the bilateral paralysis still remained undetermined.

Case V. *Bilateral Abductor Paralysis Probably Due to Contraction of Cervical Scars.* Man, aged twenty-eight years, had had tracheotomy done fifteen months before admission. Masses of tuberculous (?) glands had been removed from the neck two years before the dyspnea developed. Lungs showed no signs of active tuberculosis. Mirror laryngoscopy showed a separation of the cords of about 2 mm. on quiet respiration; on phonation they moved slightly toward the median line, but did not quite approximate. Voice was rough and deep. There was no infiltration anywhere in the larynx and an adult bronchoscope passed freely to the bifurcation. Trachea and bronchi were normal. Ventriculocordectomy on one side at a time enabled the patient to dispense with the tracheotomic cannula. One year after operation the voice was loud, but rough and high pitched. Adventitious cords developed on both sides, and they showed a degree of motility; but from laryngeal examination during phonation the sound seemed to be produced by the ventricular bands.

Case VI. *Congenital Laryngeal Stridor Due to Paralysis.* Admitted three days after forceps delivery as a "blue baby." In consultation I observed that the intense dyspnea present was clearly obstructive in character. The direct laryngoscope revealed close apposition of the cords. Respiration ceased. The bronchoscope, which was in readiness, was promptly inserted and respiration was reëstablished by a few compressions of the chest with the hand. I then did a tracheotomy with the bronchoscope still *in situ.* As I had previously tracheotomized a number of cases of congenital laryngeal stridor due to paralysis from the trauma of forceps delivery, and they had all completely recovered, I was surprised in this case to find at the end of a year and a half that the child could not be decannulated, the direct laryngoscopic appearances being about the same as when first examined. With a four weeks' interval between I did a ventriculocordectomy on each side. When seen one year later the child could cry almost as loudly as any child of its age. Direct laryngoscopy revealed a pair of adventitious cords closely resembling normal cords in color, but with a less range of motion. When the laryngoscope was introduced the laryngeal orifice was closed tightly by the ventricular bands. When a deep inspiration took place, with the tracheotomic cannula corked, the ventricular bands would separate and reveal the adventitious cords. The mechanism of the cordal movement could not be determined. On theoretical grounds I assumed that it was the result of activity of the cricoarytenoideus lateralis opposed by the resiliency of the scar

tissue at the site of operation, though the patient being a child I could not be sure some degree of movement had not returned in the cricoarytenoideus posticus. A movement of the thyroid and cricoid cartilages in relation to each other may have contributed, as may also contraction of the arytenoideus.

Case VII. *Tabetic Bilateral Abductor Paralysis.* A man, aged fifty-six years, after exposure overnight in the rain during alcoholic stupor, six months before admission, discovered that he was very hoarse. The night before admission he awoke struggling for air. He thought he would "choke to death" before morning. He was carried into the hospital sitting upright on the gripped hands and wrists of two men, keeping himself upright by holding to their shoulders with his hands. He had fallen from weakness, becoming "blind" and almost unconscious, on attempting to walk. He was blue-black in color and the stridor could be heard all along the corridor. He was carried to the operating room and for temporary relief I inserted a bronchoscope in the sitting position to avoid laying him down. He repeated over and over, "Don't lay me down; I'll choke." To attempt even local anesthesia would have been a fatal mistake and would have been quite unnecessary. The bronchoscope completely relieved the dyspnea and went deeply into the trachea without resistance. It was noted that the larynx was engorged with cyanotic blood; the cords were in close apposition, but not otherwise abnormal. I then did a low tracheotomy with the bronchoscope *in situ*. The next day the patient was gone over thoroughly; the station, gait and reflexes pointed clearly to a tabes that evidently had antedated the paralysis of the first cord, which probably was the cause of the hoarseness noticed six months previously. Wassermann examination was negative. Spinal fluid Wassermann examinations were not then in vogue. Rest, mercurial iodides, good food and abstention from alcohol in six months had so greatly improved all the tabetic symptoms that only careful examination could demonstrate them. The patient was very desirous of getting rid of the cannula. He stated that even if he had only a few years to live he did not "want to live this way." At the end of a year after the tracheotomy, there being no improvement in the laryngeal stenosis and no exacerbation of the tabetic symptoms, I consented to do a ventriculocordectomy. One side was done at a time, three weeks intervening. During an attack of infective epidemic tracheobronchitis the patient could cough and expectorate as well as before operation. The voice, at first a whisper, became a "stage

whisper" in a few months. When last seen, about a year after operation, he was able to phonate so as to be heard in the adjoining room. His tabes had progressed somewhat in spite of constant treatment.

Conclusions. 1. In ventriculocordectomy I believe we have a simple endoscopic operation that can be done under local anesthesia and that will cure almost every case of laryngeal stenosis due solely to abductor paralysis if the case is not complicated by a faulty tracheotomy.

2. Ventriculocordectomy is indicated in cases of stenosis resulting from a hopelessly paralyzed larynx.

3. This or any other form of operative clearing of the airway is contra-indicated in the first six months of abductor laryngeal paralysis. In most cases it is wise to wait a year.

4. The best means of affording relief of dyspnea and safety of the patient during this waiting period is by prompt *low* tracheotomy. High tracheotomy is the cause of more cases of cicatricial laryngeal stenosis than any other one thing. With a low tracheotomy, a pair of proper cannulæ and a daily toilet of the fistula there is nothing lost by waiting.

5. Out of 18 cases ventriculocordectomized the 7 that were uncomplicated by cicatricial stenosis were afforded satisfactory relief of dyspnea by this procedure alone. One required divulsion in addition.

6. The chief functions of the larynx are phonetic, protective and expectorative. Considered in the light of the degree of preservation of these functions, ventriculocordectomy, I venture to think, not only surpasses any previously devised operation, but is simply ideal for those cases in which neural and muscular atrophy has rendered resumption of normal cordal motility hopeless by either spontaneous recovery or neuroplastic surgery.

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Discussion

Dr. D. Bryson Delavan, New York City:

My knowledge of the subject is not sufficient for the discussion of Dr. Jackson's paper. However, we know that methods similar to this have been employed not only in the surgery of the human being but in veterinary surgery, often with excellent results. Any improvement in the treatment of the condition and in the technic of the operation is most welcome. I have listened with great interest to Dr. Jackson, and wish to thank him for the valuable instruction that he has given us.

Dr. Robert Clyde Lynch, New Orleans, La.:

I have not had any experience with the operation as described by Dr. Jackson. I have only seen two or three cases of this type of paralysis; but it struck me, during his description of the reason for the regeneration of the vocal cord, that in those cases of intralaryngeal carcinoma which I have operated on by suspension, and in which I have evidently removed a good portion of the vocal process of the arytenoid cartilage, there has been no effort on the part of Nature to reform any portion of the cord whatever. I was at a loss to know why this has occurred, since in cases of thyrotomy the cords do reform, or something reforms which takes the place of the vocal cords. That has been noticed in the cases that I have operated on by intralaryngeal resection. None of the cases have shown any disposition to renew the cord. The space remained wide open, as if the cord was rubbed out entirely. Possibly this may add something to the theory of regeneration of the cord.

Dr. D. Crosby Greene, Boston, Mass.:

These cases constitute a problem which is a very vital one. I have several patients under observation at the present time who should have surgical treatment, and I am glad to learn of Dr. Jacoksn's excellent results.

Dr. Cornelius G. Coakley, New York City:

We have seen in this connection, in our service at the Bellevue Hospital, two or three cases a year. The only treatment that we have been using has been that of tracheotomy. Most of our cases are those which come as the result of central lesions or bulbar paralyses. I should like to ask Dr. Jackson, first, whether he considers that it is necessary in long-standing, slowly-developing cases of bulbar paralysis to do tracheotomy, and, second, how much hemorrhage he gets during the operation on small children?

Dr. Henry L. Swain, New Haven, Conn.:

Like Dr. Greene, I have two cases at the present time on which I have been wanting to do such an operation, but the patients have been deterred from having this performed, because I could not promise them that they would have resonant speech thereafter. I understand, however, from Dr. Jackson that his patients can make themselves audible afterward, and that will mean that one or both will have the operation done. They are so handicapped that they cannot run or sleep comfortably at night if they have the slightest cold, on account of the swelling which narrows the very small glottic slit. One case was the result of the removal of a large thyroid in a man. The other has been going on for fifteen or twenty years. The man has the history of going to a number of hospitals. He had a tracheotomy in our hospital for an edema of the glottis which swelled the epiglottis as well as the aryepiglottic folds. He recovered, the tracheotomy opening healed and he can now live comfortably if he lives within close limitations. I should like to know what proportion of cases have to have the double ventriculocordectomy and what vocal results Dr. Jackson gets—what proportion of patients can speak audibly enough to be understood in a noisy place?

Dr. Emil Mayer, New York City:

I should like Dr. Jackson to let us know what local anesthetic he uses, what is the manner of application and the strength of that particular local anesthetic?

Dr. Chevalier Jackson, Philadelphia (closing):

Dr. Coakley raises a very important point. It was discussed in the paper. In cases of bulbar paralyses, tabes, disseminated sclerosis and other conditions that are eventually fatal, even though not for a long period of years, it is a question for the patient to decide whether he

will get along with tracheotomic palliation or will have this operation done. In many of these patients the paralysis becomes total in one cord at a time, *i. e.*, the first cord assumes a cadaveric position before the other becomes paralyzed. In such cases the patient may have a chink large enough to prevent asphyxia. When the second cord becomes paralyzed he does not asphyxiate because the other cord is in the cadaveric position.

Dr. Swain asked about the voice. The patients must be told that the voice will be reduced to a whisper for a number of months. Then it will be a stage whisper, and then they will phonate, and in a year or so they will have a voice that can be heard across the room. It is a deep, rough voice, without modulation, but abundantly loud for all ordinary purposes. It is particularly to the goitrous, traumatic and postoperative cases that the operation is adapted. Their expectation of life is longer than in most other cases. In tabes, disseminated sclerosis, aneurysm and the like it is not so long, although some patients survive for ten years or more.

Dr. Lynch's suggestion is quite apropos. It does seem to corroborate the theory I offered years ago as to the development of an adventitious cord, and I wish to thank him for the new evidence on the subject.

With regard to Dr. Swain's question about the necessity for doing a double operation after making a section on one side, usually about a month elapses before I do the second cord. If the patient should feel that he has plenty of air to get along with the second cord may not need operation; but, as a rule, I should not feel justified in abandoning the tracheotomic cannula in that case.

Regarding the name of the operation: the floor of the ventricle is excised and that is why I used the term ventriculocordectomy, faulty though it may seem.

In answer to Dr. Mayer's question about the anesthetic: 10 per cent cocain was sufficient in adult cases. Most of the patients were adults. In children no anesthetic, general or local, was used.

I wish to thank Dr. Delavan for his kind remarks, which, however, I do not merit.

Dr. Coakley:

My questions were not answered. Is preliminary tracheotomy necessary? Has there been much hemorrhage?

Dr. Jackson:

In regard to tracheotomy in cases of bilateral abductor paralysis: These cases, in which one cord becomes cadaveric before the other cord becomes paralyzed may manage to get along without tracheotomy, but I always feel that it is better to tracheotomize for such a degree of dyspnea. In cases in which both cords are paralyzed before the first cord becomes cadaveric, extreme dyspnea demands immediate tracheotomy.

Regarding the hemorrhage: It is usually insignificant. Probably the pinching of the forceps closes the bloodvessels and lessens the hemorrhage as compared to cutting with a knife. A few cases had oozing for a number of hours but ceased spontaneously in all but one case. In this case I placed a gauze tampon-pack above the cannula through the direct laryngoscope.

PAPILLOMA OF THE LARYNX IN CHILDREN, WITH THE REPORT OF AN UNUSUAL CASE

O. A. M. McKIMMIE, M.D.

When I determined to present a brief history of the case I wish to report I undertook to review the literature of papilloma of the larynx in children for the past fifteen years. In carrying out this review I have been impressed by the following facts: Our knowledge of the causation of papilloma has not increased; that nearly all writers during this period state their conviction that removal by use of the direct laryngoscope is the preferable method if removal seems best; and, further, that the number of papers on this subject during the years 1906 to 1910 inclusive greatly outnumber those published in the succeeding ten years.

I am not appending any bibliographic notes on the papers reviewed, but wish to present simply and briefly a condensed statement of the impressions gained.

The youngest children operated by the direct method were one seventeen months old and one of eighteen months.

No operative method seems to have been entirely satisfactory, operative measures having to be repeated in most cases. Numerous cases of spontaneous cure, that is disappearance without actual removal of the papillomata themselves, have been reported.

In individual cases operation has been repeated many times; in one case laryngotomy was done seventeen times.

Several writers state most positively their conviction that this operation (laryngotomy) is never justified in laryngeal papilloma even in children.

Inasmuch as I grow more and more inclined to practice and advocate whatever method of treatment I believe to be most to the advantage of the patient in the hands of the laryngologist of average skill, I desire to report the following case of multiple papilloma of the larynx:

H. B., female, aged two years, was seen at home on the night of July 2, 1915. A history of increasing hoarseness and difficult breathing for the preceding six months was obtained. She was evidently suffering marked laryngeal obstruction. I found it very difficult to get a view of the larynx, but finally got a glimpse of a granular mass which filled the entrance except for a very small chink posteriorly. The child was ordered taken to the hospital and the consent of the parents obtained to do a tracheotomy whenever I deemed it necessary. The next day, as her breathing was getting steadily worse, I did a low tracheotomy, a few whiffs of ether being used. The operation was without incident, although the neck was extremely short, the patient being very small for her age. At the end of one week I opened the larynx and thoroughly removed the masses of papilloma which practically filled the box of the larynx below the chords and extended also above them.

The patient was discharged at the end of the twenty-fifth day without the tube and with the laryngotomy wound healed. During the following five months she was perfectly well, with perfect comfort in breathing and a faultlessly clear voice.

During December, 1915, she suffered an attack of grip, which seems to have been the starting-point of a recurrence of her papilloma, which necessitated her readmission to the hospital on January 8, 1916, at 11.45 P.M. An immediate tracheotomy was done, which was followed one week later by laryngotomy.

The following 152 days were spent in the hospital, the tube being worn continuously, as I had come to the conclusion that the rest of the larynx, for respiratory purposes, would give the greatest chance of allowing the process to run its course without reinfection, if we may use such a term.

After this the mother, who had become quite expert in the care of the tube, looked after the patient at home and brought her to see me about once a week. I was confirmed in my idea of letting the patient wear the tube for an indefinite period by finding some three months after discharge from the hospital there were small papillomatous masses on both the posterior pillars of the pharynx which later disappeared spontaneously.

Phonation with the tube stopped, after removal of the inner tube, was clear but weak, but the child was afraid to have the inner tube out for more than a couple of minutes at a time. She wore the tube continuously for two and one-half years and I was about ready to dispense with it and close the tracheal opening, but did not have the opportunity, as she died of influenza-pneumonia.

The microscopist reported the masses removed as papillomatous.

Notwithstanding the increasing facility and certainty with which laryngologists use the direct laryngoscope for the removal of growths in the larynx, and the numerous reports of its use in very young children, I am still quite firmly convinced that its use, without preliminary tracheotomy, in children under four years of age is not justified, and that in very small children tracheotomy followed by opening the larynx is preferable, because this operation when carefully done permits absolutely perfect access to every portion of the organ and more perfect removal, without undue traumatism, of every particle of growth.

I am well aware that many who have large experience with such cases will differ from me in this matter. When the larynx is very small, as it was in this case which I report, it would be difficult to be sure one had removed all the growths.

As a matter of fact I do not believe it is always possible to get a larynx perfectly cleared out by the direct method even in adults, and with suspension.

The various drugs applied locally by sprays, inhalation or otherwise in adult cases, with the idea of dehydration, limiting the blood supply of the growths or causing change in their structure, have in the main been unsuccessful, and to my mind are not applicable in small children.

Radium and *x*-ray exposures have been used and a few good results therefrom have been reported.

In the case reported radium was used after the second laryngotomy, but evidently without result, inasmuch as papillomata later spread upward on to the posterior pillars of the pharynx.

Cases are reported of cure by removal followed by fulguration repeated at intervals.

It is difficult to determine whether, in a given case, the disappearance of the growth is undoubtedly the result of the treatment pursued.

I think we may make two classes of our cases of laryngeal papilloma in children: First, those in which no marked obstruction to breathing exists and in which the patients are in good general condition, and, second, those in which there is progressive difficult respiration.

In the first class we may temporize in the hope of spontaneous

cure, which has been reported by a number of observers, supplementing our waiting by such measures directed to the general health as may seem advisable.

In the second class we must consider:

1. Removal of growths by the direct method without preliminary tracheotomy.

2. Simple tracheotomy, relying on laryngeal rest to bring about a cure.

3. Tracheotomy followed by direct laryngoscopic removal of the growths.

4. Preliminary tracheotomy followed later by laryngotomy.

If our knowledge of the causation of papilloma in the larynx were greater we would be in a position to supplement our operative procedures by means to prevent the recurrence; but unfortunately every theory of causation seems to have been controverted by reported cases in which the assumed causative factors were lacking.

If one elects to do direct laryngoscopic removal in small children there is always the possibility of edema and subsequent emergency tracheotomy. For this reason I consider a deliberate, carefully-done, preliminary tracheotomy indicated, inasmuch as hurried opening of the trachea is not always without serious results.

When we consider how slight causes bring about laryngeal disturbances in small children, I believe that in children under four years of age, and even in older children who are under size, preliminary tracheotomy, permitting enough time to elapse to let the child become accustomed to breathing through the tube, followed by laryngotomy and subsequent wearing of the tube until the papillomata cease to recur, is not only justified but the method of election.

Members of this society have made notable contributions to the literature of this subject, the papers of Dr. J. Payson Clark and, later, that of Dr. Harmon Smith being particularly instructive.

In a paper read before this society by Dr. Thomas Hubbard, at the 1915 session, five cases of papilloma of the larynx were reported, two of which were in children—one four years and one eight years old—and in reading over this paper and the discussion which followed I have been particularly interested by the divergence of opinions on several points.

That the direct laryngeal method is not without possible dis-

advantage seems proved by the occurrence in one of Dr. Hubbard's adult cases within three weeks of a mass on the inner surface of the epiglottis where the tube had made pressure.

I believe that the trauma of a carefully-done opening of the larynx, which permits perfect exposure and removal of the growth with scissors, knife or very sharp curette, is less than when the laryngoscopic tube is used, and is therefore to be preferred in small children.

For the reason that irritated tissues are more likely to undergo degeneration or infection than unirritated tissue I have not used any caustic preparation after removal.

Discussion

Dr. J. Payson Clark, Boston, Mass.:

I have been interested for a great many years in papilloma of the larynx. I have not seen many cases lately. I still adhere to my position, which I have stated several times in regard to the treatment of these cases, that no treatment should be undertaken that in any way will cause permanent injury to the larynx or leave a scar. Papillomata, as you all know, resemble histologically the dermal wart, the ordinary wart; and there is some activity of cellular growth at a certain period in the life of a child which makes these growths very persistent. During that period removal by any method is not going to be successful. I believe in a preliminary tracheotomy in all cases in young children, owing to the size of the larynx and owing to the danger of rapid growth and of obstruction of the larynx following. After doing a tracheotomy, I believe in giving the larynx a period of rest. Like an ordinary dermal wart a laryngeal papilloma will often disappear in the same mysterious way that a wart in the skin disappears. Mackenzie, of Edinburgh, reported a series of cases that were treated by that method only with good results. Dr. Jackson spoke of removing the papilloma with simple forceps and getting it off without any cutting operation. That carries out my belief that it is wrong to injure in any way the normal tissue. I cannot agree with Dr. McKimmie that a laryngotomy is in any case advisable for removing a papilloma of the larynx.

Dr. George L. Richards, Fall River, Mass.:

There are some of us who because of early training still adhere to indirect laryngoscopy now and then. We were taught that in our early

days and have not become so expert in indirect laryngoscopy as some of the teachers here. I had a patient, a girl, aged twelve years, who came to me because a physician had advised laryngotomy. She had difficulty in breathing and was absolutely hoarse. On both cords were masses of papilloma. After taking the time to train the child so that she would submit to having an applicator carried into the larynx, I was able in several sittings to remove all of the papilloma with forceps. I next made applications of 95 per cent alcohol directly to the cord at monthly periods. I saw that child over a period of five years from once to twice a year. When I last saw her she was eighteen years old, and there never was any recurrence. She was saved any operation, and she has a reasonably good singing and speaking voice. Some of us are attempting to go ahead and do the old-fashioned treatment and some operations by indirect laryngoscopy. Whether the alcohol had anything to do in preventing recurrence of the papilloma it is impossible to say. Its use kept the case under observation at least.

Dr. D. Crosby Greene, Boston, Mass.:

I have had an experience with a patient with papilloma, on whom I operated once or twice by the direct method, which I think has a bearing on the subject of this paper. After I had operated upon the child two or three times his mother took him to another surgeon who operated upon him by thyrotomy and thoroughly cleaned out the larynx. Subsequently within a year I saw this patient with his larynx full of papilloma. Such an experience, it seems to me, is sufficient reason for not resorting to such a radical procedure as laryngotomy in these cases. If the growth tends to recur even after radical operation it seems to me that we are not justified in using the more radical procedure.

Dr. Henry L. Swain, New Haven, Conn.:

Like Dr. Richards, having been brought up years ago, I like to stick to my indirect laryngoscopy in my work, and I personally can do better work with it in adult cases than by the direct method. With the latter I am getting results and with the other I have some dexterity. I had a case that recurred in an adult just as I was learning to do direct laryngoscopy. I took off the next two or three with the direct method and had a return of four or five small papillomas in various parts of the larynx. The young woman became pregnant and could not come to the office, and I suggested that a spray of alcohol into the larynx

might be carried out by her family physician. It was done and four or five papillomas in various parts of the larynx receded under this treatment and had disappeared entirely by the time she was able to come to me again, only the original growth being left on the vocal cord. That I removed with indirect laryngoscopy and followed this up with alcohol for some time, with no recurrence. Then Dr. Lynch came with his suspension laryngoscopy. That appealed to me. I wished to make a demonstration of this before a medical society, and a patient came to hand just when needed. I hitched her up on the suspension apparatus and took it off. She has been well ever since. Where I am I do not know. I am sure that a lot of us who are older in the work feel that our hand is facile enough and our vision clear enough to get along with the indirect laryngoscopy for this kind of work, certainly so in the adult.

Dr. Robert Clyde Lynch, New Orleans, La.:

The purpose of this discussion is to contradict the things that I said in my early experience. In other words, just as much as I was in favor of the removal of papilloma by dissection, some years ago, thinking that I had a cure for this condition, I am now opposed to it. The first fourteen cases that I had and operated on were relieved at the one sitting, and I have never been able to duplicate that result since. My experience covers ninety cases at the present time. I have reason to speak the way I do. I believe now that any cutting operation is likely to be followed by recurrence of the papilloma. That is almost certain in my experience; not only that, but it seems to be followed by a type of papilloma that indurates below the level at which it originally grew. Therefore the deeper the tissue the harder it is to combat it surgically ever afterward. It is for this reason that thyrotomy or any type of operation is not indicated. The best results that I have had have been by drying the surface with alcohol and ether and using either fulguration or the actual cautery. For a time I thought that fulguration was the better of these two means, but now I am leaning toward the use of the actual cautery, applied practically in the same way as in laryngeal tuberculosis. The performance of a tracheotomy early in those cases in which it is not absolutely essential for breathing is to be looked on with fear and trembling, because the papilloma masses will graft themselves around the raw surface and at the distal end of the tube, and you will plant papilloma that did not exist into the trachea. You not only have laryngeal papilloma but also tracheal papilloma to deal with, which increases the difficulty of

the case. In practically every case of papilloma that I have seen there seemed to be the psychological moment for its disappearance. In other words, I have operated on cases any number of times. The greatest number of operations on any one patient was forty-two. We operated on one little patient forty-two times, which is an evidence of the inefficiency of any type of surgery that we can use—and in some of these patients we had removed the papillomatous mass completely, apparently at the time, and expected the usual recurrence within a month or six weeks, and for some reason or other there would be a cessation of return of the growth. There apparently was no difference in the look of the tissue from a pathologic or physiologic standpoint at the time of operation; yet in some of the cases there would be no recurrence; and I have never been able to tell, at the time of the sitting, whether this would be the last time to operate on the patient or not. That is one of the peculiar phases of the situation. I have been trying to find out whether there is any difference in the microscopic or macroscopic appearance of the growth or in the condition of the patient. Our examinations are identical and one patient will have a recurrence in a month or six weeks and the other will get well and never come to operation again. These cases will remain well anywhere from six months to two years. Two years is the longest period. If they have in those two years an attack of acute laryngitis, grippe, pneumonia or any acute inflammatory condition they will have a return of the growth—2 have recurred after whooping-cough, 2 after scarlet fever, 1 after measles and 2 after what was diagnosed as croup. Following right on top of it would be a return of the papilloma, which would necessitate removal. I do not see how an alcohol application once a month into a larynx could do anything except irritate it, and why that patient did not have a recurrence of his papilloma I do not understand, because we had this experience: In removing the papilloma if the instrument touched the posterior pillar we would be sure to see a return at that place in six weeks' time. In one case we touched the external canthus of the eye, and in six weeks the child had a papilloma at that place. We removed it and the child did not have a recurrence. So these growths grouped themselves at different places, and we should not do a tracheotomy except for obstruction of the breath, and we should be careful that there is no implantation of the growth by means of the instrument.

Dr. George L. Richards, Fall River, Mass.:

May I have a word more? The study of warts of the skin shows that it is the character of the fluid rather than the actual character of

the wart itself which determines recurrence; it may be the same in the papillomata of the cord. Probably the reason that these growths did not recur is because in removing them we did not happen to injure any part with the fluid content of the papilloma.

Dr. D. Bryson Delavan, New York City:

In the small, well-defined, slowly-growing warty papillomata of the larynx the use of alcohol, as suggested to me about twenty years ago by the late Dr. Charles H. Knight, will in many cases effect a cure. In certain other cases it will retard the progress of the growth, diminish its size and render its thorough removal more easy. But there are many papillomata of the more active type upon which this treatment has no effect. Also in the case of children it has generally been in my hands entirely impracticable. To be effective the alcohol must be as pure as possible, at least 95 per cent, and the applications must be made in the form of spray at least once daily, the spray being driven well into the interior of the larynx. This the patient can be taught to do for himself in order to secure the necessary frequency and regularity of treatment. In some cases a solution of sulphate of zinc, two or three grains to the ounce, makes an excellent substitute for the less agreeable spray of alcohol. In suitable cases the value of this method of treatment has been amply proved.

Dr. McKimmie (closing):

I have nothing much to say except to thank the gentlemen who took part in the discussion. Since I recorded this case I have not seen a case of papilloma in either a child or an adult that I have been called on to treat. In so small a child I should probably do what I did in this case, because I believe that even the method suggested by Dr. Jackson this morning, of removal by forceps, offers as much chance of spreading the papilloma as laryngotomy. The latter in the hands of an expert laryngologist I consider to be a safer operation. If I had a child over four years old I should probably try removal by the indirect method, because I was brought up on that and do it more skilfully than the direct method. If I had a smaller child I should probably do a preliminary tracheotomy and remove the growth by subsequent laryngotomy.

PRESENTATION OF PATIENTS, INSTRUMENTS AND REPORTS

Dr. D. Bryson Delavan, New York City:

Dr. Delavan presented a patient who had been referred to him by Dr. J. E. Rhodes, of Chicago, and Dr. Chevalier Jackson, of Philadelphia, who were in doubt as to the diagnosis and wished advice as to the application of radium for a condition which appeared to be carcinoma of the larynx. The remarkably slow progress of the disease, the unusually symmetrical distribution of the extensive infiltration, and the fact that the infiltration had not materially suppressed the movements of the larynx in respiration, together with the general appearance of the larynx, suggested the possibility of the condition being non-malignant. This opinion was confirmed by biopsy, as shown in the pathological report. The patient was referred to the Memorial Hospital, New York, where she received three applications of radium, all external. Two of these were directed to the larynx and one at a later date to the region of the clavicle. The excellent sketches in color exhibited by Dr. Jackson graphically represent the improvement which took place after the radium treatment. A subglottic lesion which had existed before the treatment had apparently disappeared. The extensive infiltration had subsided until the normal outlines of the larynx were restored and the aphonia had given place to a moderate degree of vocal power. The improvement in general in the local conditions was remarkable. The history of the case singularly bears out the theory as to the action of radium upon lymphoid tissue.

Dr. Chevalier Jackson, Philadelphia:

I feel so enthusiastic over Dr. Delavan's results in this case that I should like to say a few words: Here was a lady whose glottis was being gradually closed by the encroachment of a recurrence of infiltrating nodules. I removed them, as Dr. Rhodes had done before. The pathologist reported that he thought the condition was malignant. From the infiltrative closing of the glottis I thought that we were dealing with malignancy. The prompt recurrence rendered hopeless an attempt to keep the glottis open by repeated removal of the nodules,

and tracheotomy seemed imminent. Before doing it, however, I referred her to Dr. Delavan. After not so many weeks of perfectly painless treatment she came in with all the enormous masses that had occupied the place of the ventricular bands simply gone from under the apparently normal mucosa. It approached ideal medicine in a way that we practically never see. When she went to Dr. Delavan her larynx looked like one of those sad cases of inoperable malignancy. It is one of the most brilliant cures that I have ever seen, and I was so enthusiastic that I made the color drawings mentioned by Dr. Delavan.

Multiple Papillomata in the Larynx of a Child (Presentation of a Patient)

Dr. Chevalier Jackson, Philadelphia:

The subject of papilloma is always interesting to the laryngologist. This case illustrates points that appeal so strongly to me that I asked the father of the patient to bring her here today. It seems to me that the less harm we do in removal of papillomata the better. The tendency has been to do radical work, when we should do as little harm as possible, because we are dealing with a self-limited disease. Patients are constantly coming to the bronchoscopic clinic showing the sad results of the harmful and unnecessary removal of normal tissue, and, worse still, with the larynx entirely closed up by the perichondritis from the burns of overdosage of radium. I have devised the plan of pulling the papillomata that will come off with the gentle use of blunt forceps. I never use cutting forceps. Normal tissue will not come away with the blunt forceps and a soft touch will not harm normal tissue, not even mucosa.

The larynx was filled with papillomata, and tracheotomy had to be done for dyspnea. I removed with the crushing forceps the mass of growths. She came back a month after the operative removal of the papillomata with a warty-looking mass projecting out of the right tonsillar fossa. It was the most beautiful papilloma that one could wish to see, and so proved to be on histologic examination.

I submit, gentlemen, that if papillomata are going to recur not only in the larynx and trachea, but at so remote a location as the right tonsillar fossa after removal from the larynx, it does not do any good to operate radically on the larynx and thereby ruin the patient's voice. This child came in aphonic. By careful work no normal tissues were traumatized. She is now well, there has been no recurrence for over a year, and she has not only a loud but a smooth and perfect voice. I shall ask her to say "No." (The child shouted.)

Presentation of a Lamp

Dr. Norval H. Pierce, Chicago, Ill.:

I will take up a very few moments. This is a lamp that Müller has worked out. We intend to install it at the new Charitable Eye and Ear Infirmary when finished. Its advantages are an intense white light. The shadow from the electric filament has been eliminated so that we have a strong, full-bodied, white light which can be used both as an operating lamp by tilting on a suspending hinge and as an office lamp or examining lamp by using the lens. I have thought of making an addition to it by having a clamp placed on the upright support, which will receive the rod connected with the lamp, so that it can better be used in mastoid work or in any operative procedure about the head and be immediately over the operative field.

GENERAL MEASURES IN THE TREATMENT OF LARYNGEAL TUBERCULOSIS

LAWRASON BROWN, M.D.

My appearance before you today must recall to your minds the opening sentences of one of Cicero's orations against Cataline. My temerity in accepting the invitation of your secretary was brought about by the fact that some laryngologists, none of whom I believe is a member of this society, seem to consider tuberculosis of the larynx a local disease, and to treat it accordingly.

While tuberculous laryngitis is rare in children, and more often found at autopsy, it occurs in about 25 per cent or more of adults with pulmonary tuberculosis, slightly more in men than in women, and next to tuberculous enteritis and colitis is the most frequent complication of pulmonary tuberculosis, due most likely to direct infection of the part by the sputum. Even early cases—cases in the incipient or minimal stage—are not spared (12 per cent), but as the pulmonary disease progresses the laryngeal complication becomes more frequent (moderately advanced 26 per cent; far advanced, 45 per cent). The importance, then, of a complication so frequently seen among patients with pulmonary tuberculosis cannot be exaggerated.

Laryngeal tuberculosis is rarely if ever a primary disease, a statement with which I am sure many of you will agree. I am familiar with Donellan's paper,[1] in which he attempts to prove that primary laryngeal tuberculosis is not so rare as it is usually considered. He has collected many cases which he says had the first symptoms of tuberculosis from the larynx. The lungs were normal, as experts could detect no changes. Today, since the *x*-rays have been widely used in pulmonary disease, we know that such evidence, *i. e.*, the usual physical examination, alone is worthy

[1] Transactions of the Seventh Annual Meeting of the American Laryngological, Rhinological and Otological Society, 1901, p. 277.

of slight consideration. He quotes two cases with autopsies, one of which had an old diffuse tuberculous laryngitis, had "recent granulations in one apex" and the second, described by B. Fränkel[2] had ulcerative tuberculous laryngitis for five years with tubercle bacilli in the sputum and normal lungs at autopsy. Birkett[2] says but three cases have been described.[3] So if it is in practically every instance secondary to tuberculosis, usually pulmonary, as seems most probable, the problem is not the treatment of a laryngitis alone any more than the problem of typhoid fever is the treatment of a diarrhea alone. In both diseases these manifestations may thrust themselves upon our notice, demanding emphatically treatment—treatment, however, which may prove of little avail unless general treatment is enforced.

The general treatment of tuberculosis is the same no matter what organ is involved. At the risk of repeating what is well known to all of you, I would like to stress a few points concerned in the general treatment of laryngeal tuberculosis: Some twenty years ago we refused all patients with laryngeal tuberculosis at the Trudeau Sanatorium, for we felt the prognosis was bad, and with the treatment we used at that time it was nearly always fatal. More recently, however, we have not hesitated to admit patients with laryngeal tuberculosis, provided, of course, that it was not too extensive and that they were otherwise eligible. Our results have been very satisfactory. We are no more laryngologists today than we were then, but one vital essential in the treatment of tuberculosis has become, if I may so express it, part of us. I refer to rest. Today, to use his expression, we put the patient on silence and give the larynx absolute rest, except for such movement as occurs in breathing, swallowing and coughing. We forbid whispering, whistling and every other use of the larynx. The results from this absolute rest are just as striking as they are in the case of tuberculosis of the knee, of the hip, of the spine or indeed of any other organ that can be given nearly 100 per cent of functional rest. I have been impressed by the fact that few patients who were under my care had been kept silent. I have wondered it if were not due

[1] Deutsch. med. Wchnschr., 1886, p. 490.
[2] Osler and McCrae's System of Medicine, iii, 630.
[3] Demme, Pogrebenski and Orth.

to a mistaken kindness on the part of some physicians who knew but who thought it almost cruel to use such drastic measures. I can assure you that while it is difficult it is far from unbearable, for I myself have used a pad and pencil and uttered no sound for six weeks. Having done this myself I have not the slightest hesitation in demanding it for my patients, and it is always a surprise to me how readily they agree to it and how conscientiously many of them carry it out. This method has changed our entire outlook upon the prognosis of laryngeal tuberculosis, and, in the more slightly affected, recoveries now replace fatalities. It is true, of course, that more careful examinations of the larynx reveal earlier lesions, which are, I believe, often prevented from progressing.

Absolute rest recalls that in pulmonary tuberculosis it is at times necessary to put a lung out of commission by collapsing it—by splinting it, so to speak, with air. Absolute rest of the larynx can probably be most nearly attained by performing tracheotomy and the use of a tube. Dr. Chevalier Jackson[4] has reported three cases of laryngeal tuberculosis, supposed to be primary, who wore tracheotomy tubes and got better. In the vast majority of cases such radical measures are not necessary and in others the great amount of pulmonary secretion would certainly prove very trying and the results, I fear, would be very uncertain.

I would not imply that you do not advise rest, but I read in articles on the treatment of tuberculous laryngitis by excellent laryngologists statements such as this:

"Vocal rest is a very necessary adjunct to the successful treatment of many cases of tuberculous laryngitis." "Vocal rest" may mean no singing, no shouting, no making of speeches, but as much talking as the patient desires.

"The patient should not be permitted to use his voice," writes another, "except in the mildest whisper, and even this should be restricted in amount." Rest in laryngeal tuberculosis should be defined in no uncertain terms, and, as I have said, should be for a time at least absolute. Put a card on the head of the bed stating that the patient is on silence and no conversation is permitted,

[4] Transactions of the Tenth Annual Meeting of the American Laryngological, Rhinological and Otological Society, 1904, p. 123.

as has been suggested by Robertson. How long such absolute rest should continue must depend upon how the lesion progresses. Lip-whispering, then ordinary whispering, next an occasional sentence in speaking tones is the method of progression, but singing, shouting and public speaking should be avoided for some months after recovery.

Personally, I go further in the rest treatment and do not hesitate to put my patients to bed for six weeks, with wide-open windows, or better still, upon a porch during the day and in a well-ventilated room at night. I do this for the following reasons: Pulmonary tuberculosis is usually present and partial rest of the lungs as much as is possible is thus effected. Cough, which may injure the larynx when excessive, is better controlled by rest in bed than by any other means for reduction of the number of the respirations means lessened irritation of the irritable lungs, consequently lessened secretion, and in turn lessened cough, and so less sputum flowing over the larynx.

All of us believe in the conservation of natural resources. The conservation of our bodily forces in the struggle against any chronic disease like tuberculosis is far more important. Where these are conserved I like to picture to myself the increased amount of antibodies that may be formed, the increased reaction of the cells about the focus to the poison and the increased and more rapid formation of scar tissue. If this is in part hypothetical, we do know that fatigue in animals lessens resistance and decreases antibody formation.

There is still another point I should like to stress: In chronic disease, and especially in tuberculosis, almost any change under rational conditions benefits the patient. The greatest response to change of climate occurs in the first few weeks, and for this reason I urge all of my patients to take advantage of it by remaining at rest, usually in bed. I cannot help feeling that if patients with laryngeal tuberculosis were put to bed and kept silent at home at the very onset of treatment, at the time when the iron of response is hot and will yield most readily to the hammer of advice and treatment, the tendency toward recovery would be much more marked and gratifying than it is at times today, even though you cannot change his quarters and must be satisfied with open windows and no porch in his usual surroundings.

Most of you, I am sure, will agree with me that recovery from laryngeal tuberculosis depends in most instances largely upon the condition of the pulmonary tuberculosis. With advancing pulmonary disease, fever and poor nutrition it is difficult to promote healing in a tuberculous larynx, but I have seen it done with the aid of the electrocautery. However, the lungs play such a large part in the treatment of this condition that any line of treatment that fails to consider primarily the lung disease may in the end result in the loss of the patient.

This period of rest that I have mentioned gives the patient a chance to readjust his ideas, and, more important still, affords him an opportunity to become orientated and gives us a chance to educate him along the lines he must follow if he wishes to recover. As soon as I deem it advisable I put him on exercise, for a good general condition, good muscular tone which has greatly increased under bed-rest in fresh air are conducive to a more speedy recovery.

I have dwelt upon this point, for I have thought it possible that a few laryngologists still seemed to hold to the idea that local treatment was *the* important thing. I do not believe less in suitable local treatment but more in local and general rest, for the usual hygienic-dietetic treatment properly applied with local rest will cure about 50 per cent of all early cases.

In regard to local treatment, I feel that the laryngeal dropper, devised by Dr. Yankauer, of New York, is not yet widely enough known and used, for I can now recall only one or two patients who have come to me with laryngeal tuberculosis who had ever previously employed it. One patient, I remember, an important person, had a laryngologist or his assistant pay her two visits a week (at $25 a visit) to drop argyrol into her larynx, which she herself learned to do in two or three days with the laryngeal dropper. The important advantage of this dropper is the fact that the patient can remain quiet and at home and apply local treatment efficaciously. I do not mean to imply that local treatment in the office can be entirely done away with, but to see a poor, weak patient dragging one foot after another, running a daily temperature of 100° to 103°, coming two or three times a week to the physician's office to have his throat touched with lactic acid or formalin or some other solution, however much temporary relief it gives, is

to me a sad commentary upon the art and practice of medicine, for such injurious visits should not be and are not neeessary. I realize that busy men cannot treat these patients at their homes. I also realize that they demand treatment. The best solution of the problem seems to me to be for the tuberculosis specialist to acquire sufficient knowledge of local treatment to enable him to carry out the directions of the laryngologist at the patient's home.

To produce rest and to facilitate swallowing, freedom from or lessening of pain is necessary. I have tried injection of alcohol into the superior laryngeal nerve with some success, but the respites have never been long. I have not tried resection of this nerve, which has yielded some good results.[5] The insufflation of anesthesin or orthoform has been helpful. In these cases the laryngeal dropper has proved a godsend. Before the application of drugs I have the patient thoroughly rinse or wash out his larynx with physiological salt solution. This removes in great part the tenacious mucus and permits the local applications to reach the surface of the ulcer. I have found that for most applications the dropper was far better than the atomizer, and just as efficacious as the intratracheal syringe in the physician's hands. Further, the patient can apply the drug before each meal and whenever the pain becomes excessive. Menthol (1 per cent) in oil is an excellent application to begin the method upon, for if the patient swallows it no harm is done. Then stronger solutions of menthol, emulsions of anesthesin or what I have found is best of all, Freudenthal's emulsion of orthoform and menthol, can be applied as necessary. I have by these methods been able to avoid largely cocain with its disagreeable after-results. In a few cases I have not hesitated to use morphin hypodermically when necessary.

The apparently marked benefit produced in intestinal tuberculosis by the ultraviolet rays, or at least by some factor concerned in the treatment, has encouraged us in their use in laryngeal tuberculosis, for it can be administered in the patient's home. Some have devised special lamps for the application of these rays directly to the larynx, feeling that they would act like the sun rays, which I understand have been so successfully employed in Colorado. I have used natural heliotherapy in five cases and have

[5] Mayer: Abstracted in British Med. Jour., 1921, i, 35, also Wien. klin. Wchnschr., January 6, 1921.

had excellent results in two, though two were too far advanced to hope for any benefit. On the other side, in two patients with chronic disease general radiation was employed and excellent results obtained. I have used ultraviolet rays from a mercury vapor quartz lamp, but excellent results have been obtained (by Blegood) with the use of arc lamps, which give off much violet ray.

More recently I have been interested in the use of a thin solution of gelatin, suggested by Mr. Petroff from his studies in physical chemistry. He afterward placed in our hands a strongly immune serum (sheep or goat). Spraying the larynx with these substances apparently afforded a few patients marked relief, but in others was of little avail.

Laryngeal tuberculosis has long been looked upon as a contra-indication to pregnancy, for when this condition occurs the larynx, if at all seriously affected, often quickly grows worse. In such cases I should not hesitate to advise abortion in the first three months of pregnancy, but after this time little benefit can be hoped for from the operation. Students of tuberculosis are not yet agreed upon the causes of the bad effects in many instances of pregnancy and labor upon pulmonary and laryngeal tuberculosis.

In conclusion, I should like to say that about 100,000 persons die from pulmonary tuberculosis in the United States every year. At least 40 to 50 per cent of these have some laryngeal tuberculosis. If patients live on the average about three years there must be about 300,000 or more patients in the United States of whom 25 to 50 per cent have laryngeal tuberculosis. In all, then, about 100,000 have laryngeal tuberculosis. Many of these are people with slight or no means. Treatment of their throat condition must in large part devolve upon the medical men doing tuberculosis work. They feel their shortcomings and are eager to turn to you for help. But when they see a patient with high fever dragged to a laryngological dispensary, which they know is wrong, they realize that they or someone else has erred. You can help solve this problem, for it is yours and ours. We cannot do so alone, and I venture to say that you too cannot do so alone. The tuberculosis specialist must direct the general treatment, and will be, I am sure, for a long time to come, the only person to give such laryngeal treatment as you advise to many of these sufferers.

CLIMATE IN THE TREATMENT OF LARYNGEAL TUBERCULOSIS

CARROLL E. EDSON, M.D.

Tuberculosis of the larynx is practically always secondary to an active pulmonary tuberculosis. The extent and character of the primary lesion usually determine our choice of climate for the patient.

To discuss satisfactorily how the supervention of the laryngeal infection may modify this selection, we must have a clear understanding of the part climate plays in the cure of pulmonary tuberculosis. We must know just what reaction we expect to obtain when we recommend a change of climate.

The arrest of a pulmonary tuberculosis is brought about through tissue and physiologic resistance to the tubercle bacillus and its products. At present our only means of cure are those which directly or indirectly perfect, maintain or increase this resistance.

The essential factors to this end are:

1. Outdoor life in pure air and sunshine.
2. Abundant nutrition.
3. Rest.

An outdoor life means living constantly in the open air. Its effectiveness is directly in proportion to the number of hours so spent out of every twenty-four. Its benefits are not secured by the patient going out occasionally for recreation, but only by passing his entire life, as far as possible, in fresh, open air, not only while at work or play, but while at rest, and especially during the hours of sleep.

Abundant nutrition means not an amount of food eaten or even of fat accumulated, but the highest maintainable balance of nutrition. It is not food ingested which counts, but food made physiologically active. To secure this maximum requires careful attention to all the patient's metabolic processes of digestion, assimila-

tion and especially of elimination through the bowels, kidneys and skin.

Rest is economy of physiologic expenditure. Its importance in tuberculosis cannot be overestimated, but it must be carefully controlled. It is a relative term and its meaning will vary according to the individual patient from absolute confinement in bed over long periods to such graded and controlled exercise as may approach full measure of work. It includes not only the limitation of muscular exercise, but control and regulation of the intellectual and emotional activity of the patient.

While all these factors are important it does not follow that there is equal need of each for every patient. One will be most helped by rest, his nutritional balance being already well established, while another stands in urgent need of food, or may be wholly untrained to hygienic living or the uses of fresh air. For this reason close and prolonged medical oversight is essential to secure the patient's gaining the maximum benefit from and proper distribution of the factors of rest, food and outdoor life.

What help do we gain from climate in this scheme of living?

Climate is the sum total of the meteorologic conditions prevailing in a given region over considerable periods of time. It is the average mean and range of meteorologic phenomena characterizing that place. Weather is the immediate state of those phenomena at any particular time. It is important to have this distinction always in mind. Their confusion has caused disappointment to patients and resentment against the climatologist. The weather may be very bad, wet and cold, for instance, at any one time, although the average usual conditions in that place at that time of the year are warm and sunny days. Equally a region of general cloudy or damp climate will have its warm days of bright sunshine.

Climate being the whole average state of meteorologic conditions prevailing in any region, every patient, wherever he dwells, lives in a climate of some kind. It is incorrect to speak of the climatic treatment of tuberculosis as one would of the quinin treatment of malaria, as if it were a specific. It is equally absurd to contrast it with medication by tuberculins or confinement in a sanatorium, as if it were a means which could be used or not according to choice or prejudice. The climate has to be considered in every case.

It cannot be avoided, for it is the environment of temperature, sunshine, humidity, rainfall, wind and barometric pressure in which the patient lives. If we keep him at home we select a climate for him as fully as if we send him away.

The application of climate to the cure of pulmonary tuberculosis is therefore only the best utilization of these average conditions to aid in securing the fullest measure of the necessary outdoor life, in bringing some of the meteorologic components to the support or upbuilding of nutrition and tissue-resistance to the disease or in maintaining physiologic rest.

A continuous outdoor life being of first importance for his cure, it follows logically that there must be an advantage to a patient with pulmonary tuberculosis in placing him promptly in a region where he can most constantly, most comfortably, with the least difficulty and fewest interruptions, lead such a life.

The process of healing in a tubercular lesion is slow and the establishment of complete arrest requires a period measured not by days, but by months or years, during which time the patient should live outdoors. It is not the occasional pleasant day, accordingly, which counts, but the probability of such days prevailing abundantly over long periods.

Theoretically, a patient can be kept outdoors in any weather—and pure air is the same everywhere—but in the actual management of a patient's life it is not the academically possible, but the easily practicable which counts the most.

The character of the weather from day to day has a great influence upon the ease and safety with which an invalid can spend his time outdoors, and the readiness with which he submits to the outdoor regimen.

In one region the winter temperature of the air, for instance, may range so low as to require so much clothing as to be a burden to a weakened or delicate patient. It may fall so low at night as to forbid his sleeping out at all, thus depriving him of one-third of his outdoor life. In another place the summer temperature will be so high or accompanied by such humidity as to be seriously oppressive, diminishing the appetite or preventing such exercise as is desirable. A change from such a climate to a cool and breezy one will obviously be of advantage to the patient.

The degree of actual and relative humidity affects our sensation of temperature and our endurance of heat or cold. It directly influences heat loss and consequently is a factor in the metabolic balance.

The amount of sunshine, the percentage of the total possible which is actually realized in any place, is of great importance to an invalid, especially if he must be inactive during the cold of winter days. In one region there may be in winter out of a hundred consecutive days an average of only twenty which are clear, while in another during the same period less than twenty will be cloudy.

Whether he be at rest or active it is not so easy for a patient to live outdoors, even if the air be equally pure, in a place where fog or drizzling rain is frequent, as it is where week after week goes by without rain or cloud.

Similar comparative illustrations might be given of other climatic factors which are of physiologic importance to a person planning to live a long-continued outdoor life; the frequency and force of high winds influencing heat loss in cold weather or causing nervous wear if hot and dry; the regularity and extent of the diurnal range of temperature or the frequency and degree of variations from the mean.

But these examples are sufficient to indicate how the physician who is mapping the plan of life for a pulmonary invalid should consider whether he can better the conditions under which the patient is to make his fight by sending him to a more salubrious region, just as he would move another patient from a dark, unventilated closet in a tenement alley to an open-air ward in a municipal hospital. We improve the surroundings to the extent of our ability and the patient's means. We strive to place each patient where the climate conditions most facilitate his leading the proper outdoor life.

If such favorable conditions are found to a greater degree, or in a more constant measure in another region than the patient's home, we advise him to go to that place to live; we urge him to make a change of climate. He moves into better meteorologic surroundings, as he might from a damp, poorly heated house to a dry and sunny one.

A change of climate for the purpose of facilitating an outdoor

life should be prescribed, however, only when it can be made without more than counterbalancing loss in the other factors of the cure—nutrition, rest and medical control. There is no gain to a patient in placing him in the most ideal climate if to do so deprives him of the means of securing sufficient proper food or the other conditions of right living. A patient who at home might have abundance of food and care, and, even if idle, continue to have it through family assistance, may not away from home be able to command that aid in the form of money. To earn this by his own exertion may demand labor at a time when work or activity is most detrimental. Either nutrition or rest must suffer. Such patients are better off at rest amid such conditions of outdoor life as his home climate affords.

On the other hand one whose physical state warrants labor or whose social and financial circumstances force him to work may often find that the gain from a more equable, milder or more bracing climate will enable him to continue at his occupation, as he could not under the old less favorable conditions. If his only days for outdoor rest are his Sundays he will benefit from living in a region where he can sleep out the entire year, and where forty of his weekly holidays are likely to be pleasant and sunny, instead of in a place where at most he might count on fifteen to twenty without rain or cloud.

Closely related to the question of nutrition and rest is that of proper medical supervision of the patient's life. The exceedingly elastic meaning which we must give to the term "rest," necessitates such competent medical control of the patient wherever he may live. This is especially true of cases with complications, such as laryngeal involvement, for instance, which may need local treatment. In determining upon a change of climate it is important, therefore, to know whether in the new region of better outdoor facilities the patient can have a sufficient degree of skilled medical advice. It is equally important to impress upon his mind the need for such control in the new abode. Patients too often act as if they had been told that the change to a different climate constituted the whole cure. It only affords a better opportunity to work out that cure.

Finally, certain physiologic reactions to climatic factors must be

borne in mind. The problem of nutrition as we know goes deeper than the mere question of food supply. So a change of climate may, by reason of altered conditions of temperature or sunshine, prove beneficial to one patient by stimulating appetite, digestion and assimilation. It may be unavailing to another because some factor, it may be of barometric pressure or humidity, makes demands upon his circulation or emunctories beyond their power of response. This so disturbs the physiologic balance as to offset the other advantages of easier outdoor life.

As I am now asking your attention only to the general principles controlling the selection of climate for the pulmonary invalid, it is unnecessary to go into a detailed discussion of these varied physiologic reactions. I state very briefly only those meteorologic factors of climate which experience has shown to directly influence and be most conducive to improvement in pulmonary tuberculosis.

1. Moderate or Fairly High Altitude. Such elevation, besides giving greater diathermance to the air and stronger sunshine, has a direct effect on hæmopoiesis, promptly and decidedly increasing the formation of red corpuscles.

2. Temperature. Cool climates are definitely conducive to nutritional improvement. Almost without exception patients make their best gain during the cold months. In southern latitudes elevation aids in securing this cooler climate. A moderate daily range of temperature, is desirable as is a reasonably well-marked annual range. Both give variety and stimulate circulatory action. Sudden violent or long-continued variations from the mean are to be avoided, as they tax the patient's physiologic response and may interrupt the routine of his outdoor life.

3. Sunshine. The value and results obtainable from heliotherapy have been most astoundingly shown by Rollier in his clinic at Leysin. The more abundant and continuous the sunshine the better available is this valuable means of cure. The dosage must be carefully controlled, for direct sunlight, especially in high altitudes, is a powerful force not without capacity for harm. A climate of strong, continuous sunshine makes feasible an uninterrupted schedule of treatment.

4. Humidity. The actual, and especially the relative, humidity of the air is perhaps the most important single factor in our com-

fort outdoors. It has most to do with the rate of heat loss from the body surface and with our endurance of the extremes of heat and cold. The drier the air the better each is borne and the more enhanced the value of the direct sunlight.

5. Precipitation. The important desiderata are a low annual rainfall and a reasonably even distribution of it through the year, so that the hot days of summer may be refreshed by short showers and the rain or snowfall of winter be not too frequent or too long continued.

6. Wind. A moderate regular movement of the air is most desirable for its effect on the cutaneous systems, both nervous and circulatory. It is the movement of the air upon the skin which stimulates and gives the exhilaration so associated with fresh air.

To be shunned are frequent, violent or long-continued heavy winds, especially in the cold of winter or during seasons of high humidity. Equally is the close association of high wind with great dryness and dust, an evil partnership for discomfort and harm.

How does climate help the patient with laryngeal tuberculosis and what choice of meteorologic components is desirable in his case?

Tuberculosis of the larynx responds only in a general way and to a slight degree to the increased vitality induced by outdoor life and nutrition. The local laryngeal lesion is less directly affected than pulmonary tubercle by these factors. Its arrest is more dependent on the third member of the physiologic triad, rest.

Under the establishment and maintenance of complete rest the prognosis of laryngeal tuberculosis is much better than is popularly believed. This complete rest, incomparably the most important part of the treatment we can bring to bear, is curiously difficult to secure.

The first, the most effective means to this end, the hardest to obtain is silence, the absolute avoidance of all phonation. I need not enlarge upon this statement before this Association, but I do wish to put the whole weight of my professional experience into urging you to impress upon your patients and your pupils an appreciation of its importance and value as a working therapeutic fact and not a theory only.

Next in value to silence in securing the fullest rest to the larynx

is the abolition, reduction or control of cough from whatever source it arises.

The cough of infraglottic origin, rising from the pulmonary disease, will lessen with the improvement in that lesion.

Climate, as I showed, is a valuable aid in securing that arrest and often gives surprisingly prompt results in diminishing the cough. The local laryngeal irritation most soothed by rest may occasionally need local sedative applications. It is, however, to a considerable degree affected by atmospheric conditions presently to be mentioned, the control of which may greatly assuage the patient's discomfort.

The supralaryngeal cough caused by nasal, and especially pharyngeal, trouble is a factor of great importance in its wear upon the patient. From my observations it is not sufficiently appreciated or given enough detailed care. Even in purely pulmonary tuberculosis no small fraction of the most annoying cough is alleviated by proper and painstaking care of the catarrhal or obstructive congestion of the upper respiratory area. In laryngeal tuberculosis the cough from these sources is especially harmful, for it remains always a non-productive, unnecessary cough of purely mechanical violence.

Now it is in helping control and lessen the cough arising from the nose, the pharynx and the glottis that certain climatic factors play a definite and direct part. So important and so readily demonstrated is this role that the presence of a tuberculous laryngeal lesion calls for special consideration of them in the choice of climate. The later development of a laryngeal tuberculosis may make for the first time a change of climate advisable.

A patient with laryngeal tuberculosis does not endure well excessive heat or cold. Such patients are prone to loss of appetite and poor nutritional balance even before any pain on swallowing has occurred. This early loss of weight and the frequent accompanying anemia is out of proportion to the added amount of tubercular disease. I believe it is the result of anxiety, discouragement and fear born of the knowledge and constant evidence of this complication. Consequently any added cause for poor appetite and assimilation, such as heat or humid weather, is to be avoided.

Equally do such patients suffer from great cold, especially at

night, and the irritation from breathing very cold air may excite so much cough as to prevent sleeping out. Thus one of the most valuable opportunities for combining fresh air and rest will be lost. Even though the daytime cold is modified by bright sunshine, very cold nights or too wide a diurnal range in temperature are to be avoided. For these reasons it may be advisable for a patient who can afford it to make a winter sojourn in a more southern, warmer station and change to a cooler, more bracing region in the summer months.

Abrupt or marked change in the temperature of the respired air readily induces cough, as we well know. Climates characterized by such sudden or frequent changes are to be avoided. Damp air, especially if at all cold or in motion, is an immediate excitant of cough to an inflamed larynx or sensitive rhinopharynx. Therefore, the greatest benefit will accrue to the patient in a mild, equable climate, with a dry air, low relative humidity and long periods without wet weather, one too in which the precipitation is fairly evenly distributed in short downfalls rather than in a prolonged rainy season. Strong winds and dusty air are sedulously to be avoided. Frequently in the same region of generally similar climatic conditions one locality will have a topography yielding shelter from the prevailing wind. It will so be entirely suitable, while a station near at hand not so protected is undesirable. Such local details are important to consider even after the general problem has been settled. Indeed, the whole success in the cure of laryngeal tuberculosis is a matter of appreciation of and enforcing attention to detail.

In this connection may I add a word, even if it seems a criticism? Too often we see patients sent long distances from home at a sacrificing cost to gain the advantage of a better climate for living outdoors, who, because of a laryngeal lesion, take frequent or even daily trips to the physician's office. There they sit in a crowded, often poorly ventilated room awaiting their turn for local applications. This travel and waiting are undertaken frequently when the exertion involved or the presence of fever forbid such conduct. Any such patient with acute laryngeal tuberculosis which needs regular treatment should be cared for at home. If the laryngologist cannot give the time for such visits the patient will be best placed

in a sanatorium where the means for local treatment are at hand and where he does not have to pass his waiting time indoors rereading a last year's copy of *Outdoor Life*.

These, briefly, are the principles underlying the use of climate in the cure of laryngeal tuberculosis.

There is no specific climate for tuberculosis.

The disease may heal in any climate.

Some climates, however, offer the patient an incomparably better opportunity to make full use of the three requisites for cure: an outdoor life, increased nutrition, physiologic rest.

Laryngeal tuberculosis does not require a climate essentially different from that for pulmonary disease.

It does benefit, however, from attention to a few details. These are: care in selecting a milder climate without extremes of heat or cold, especially the latter; freedom from frequent sudden changes in temperature, damp air, particularly in winter, and high winds and dust.

A careful consideration of the balance between the patient's needs, his means and the reasonable advantage to be gained from a change in surroundings is necessary to avoid disappointment or disaster. To make a correct selection the physician must understand the climatic characteristics of both the home and the contemplated resort. He must have an accurate knowledge of and an interest in meteorologic statistics and be able to interpret them properly in terms of physiologic effect upon the patient.

Future advance in the best utilization of climate will come with a greater appreciation of the fact that the physical modalities of temperature, humidity, sunlight, wind and barometric pressure are real and definite in their action. The more complete our study and knowledge of the physiologic response which they demand from a patient the better use we shall be able to make of these climatic components in the environment we select for the invalids who seek our counsel or depend upon our care.

THE SURGICAL TREATMENT OF LARYNGEAL TUBERCULOSIS

(Read by Title)

ROBERT LEVY, M.D.

THE curability of laryngeal tuberculosis is no longer a moot question, although the means by which the cure is accomplished is still a fruitful source of difference of opinion. So many cases of spontaneous cure have been recorded that Nature's method at any rate is accepted without objection. Man's faith in Nature's wonderful achievements discourages dispute, especially when confirmed by human observation.

On the other hand there still seems to be a large number of practitioners, general as well as special, whose belief in the virtue of active therapeutic measures is, to say the least, extremely weak if not entirely wanting. This is particularly true of such measures of which this paper treats and can be explained by the firmness with which tradition grips the profession and the difficulty with which certain old and accepted views are uprooted.

It is within the memory of many members of this Association when to attempt any active local treatment for laryngeal tuberculosis was little short of criminal. No great wonder, therefore, that a radical reform should be difficult of acceptance, and especially when such reform swings the pendulum too far. The enthusiasm following Heryng's, Krause's and Goughenheim's reports, 1886 and 1887, was rather short-lived, and within a very few years a reaction set in which has done much toward clarifying the treatment of this affection.

The majority of laryngologists whose practice includes many tuberculous cases have come to the conclusion that the surgical treatment in some form or other is a valuable factor in the management of this disease, and still one occasionally sees reports in which only palliative or medicinal measures are recommended. It is only

fair to say that the most authentic of these reports are not of the most recent dates, as, for example, the one of 241 cases reported by the Rutland State Sanitarium,[1] dated 1914. I am inclined to think that a report from such an institution made at the present time would at least mention favorably the galvanocautery. In addition it is the writer's personal observation that, exclusive of published opinions, there is a not inconsiderable number of men who through lack of faith or patience in treating these cases, or who having no regular connection with a tuberculosis sanitarium, find so much to discourage them that they readily condemn all methods of treatment except the hygienic.

While the majority of writers agree that surgical treatment in some form or other is of more or less value, there is still a certain lack of definiteness as to the method, the extent of applicability or specific indications for its use.

Under the head of surgical treatment are included:

Intralaryngeal measures.

Extralaryngeal measures.

The latter can be dismissed with very little discussion, for neither tracheotomy nor laryngotomy with excision of invaded parts, or laryngectomy has been used extensively enough by a sufficient number of men. Laryngectomy is certainly making no progress in the treatment of laryngeal tuberculosis; its status seems to be about the same as stated in 1913, that "so long as success has attended simpler measures, and so long as this success is rapidly increasing the number of cures, extensive life-endangering operations must be condemned."[2] Arnoldson,[3] after an elaborate compilation on external operative measures, concludes that such operations, excepting tracheotomy, can only be considered when it is possible to remove all of the disease. This is impossible in all except early cases, and in these other less radical measures preclude the necessity of laryngectomy or even laryngotomy.

Tracheotomy may be considered in quite a different light. Its value as a palliative measure, whether for the relief of dyspnea or dysphagia, is well recognized in spite of the objections (Lake[4]) that it interferes with cough and expectoration and that the wound becomes seriously infected or leads to rapid extension of the disease of the lungs. These objections are more theoretical than practical.

As early as 1879 Beverly Robinson[5] recommended tracheotomy for curative as well as palliative reasons on the same principle that Moritz Schmidt did, that is, for the purpose of putting the larynx at rest. Nevertheless, tracheotomy has received but little more encouragement than laryngectomy, and one cannot help but voice the thought that the last word as to the value of this procedure has not been said and that some courageous, perhaps bold, operator will show us its true worth.

Intralaryngeal surgical intervention includes incision, excision, curettage and galvanocautery. Obviously, these measures should not be used indiscriminately or promiscuously. Nor are they necessarily to be exhibited only for curative purposes. The destruction or removal of diffuse tuberculous infiltration or circumscribed masses has its value for the relief of dyspnea or pain quite beyond any other method of treatment. The reason for this is based on the well-known studies of Goughenheim and his pupil Dansac,[6] who showed that the pain in tuberculous laryngitis, or arytenoiditis as they called it, was due to certain nerve lesions producing hyperplasia of the nerve endings, "pseudoneuromata." Dansac says: "We have been struck by the relief which surgical treatment nearly always gives to the sufferings of these patients," which observation holds good today to a large degree.

From this point of view it is easy to see that many cases which were considered unsuitable for surgical treatment may now be given the benefit of such treatment when used with discrimination.

The contraindications for surgical treatment laid down by Heryng[7] were:

Advanced phthisis with hectic and wasting.
Diffuse miliary tubercle of the larynx and pharynx.
All cachectic conditions.
Severe stenosis of the larynx.
Patients exhibiting fear and nervous excitability.

Except in cases of severe stenosis prior to tracheotomy, *properly selected* surgical measures *properly carried* out, and with palliation more in mind than cure, these contraindications may be largely disregarded. Obviously, one would not indulge in extensive curettage or galvanocautery in the presence of widespread edema or intense redness with acute manifestations. Nevertheless, the writer has

seen great relief to pain following the judicious application of the galvanocautery even in diffuse miliary laryngeal and pharyngeal tuberculosis.

The ideal condition for surgical interference is one in which the tuberculous process is definitely limited or circumscribed. This occurs in so-called tuberculomata and in the very early stage of the disease. Unfortunately many cases are not seen early enough, the consequence being that the area involved cannot be definitely determined; in fact, this is often impossible even though the laryngoscope reveals a fairly well-circumscribed infiltration or ulceration.

A specimen presented before the American Laryngological, Rhinological and Otological Society,[8] in 1906, in which, postmortem, a section from the trachea showed tuberculosis, demonstrated how far from the site of the disease as seen with the laryngoscope the lesion may exist. Fetterolf,[9] in 1914, in a "Study of the Larynx in 100 Cases Dying of Tuberculosis," showed how extensively the disease was distributed. Of course, this was to be expected in advanced cases, but the point is that even though it were possible to recognize the very earliest manifestations the fact remains that patients are not seen by a competent laryngologist until considerable involvement has taken place.

Recognizing, therefore, that for surgical treatment the ideal, early, limited, circumscribed lesion is rarely presented, does more or less extensive involvement constitute a contraindication? The answer is found in the many cases reported in which the patient was not only relieved of distressing symptoms, but in which not infrequently the voice was restored and the disease arrested.

Saupignet[10] removed the mucosa and perichondrium over the arytenoid region by repeated operations until cicatricial tissue covered the parts, resulting in relief to dysphagia and respiration and improvement in the general condition. This method is certainly too radical to find favor with many, but it shows what can be done in the way of healing even in extensive disease. Lockard[11] showed how readily healing takes place, even though operation does not remove all tuberculous involvement in a large number of epiglottidectomies, and his experience had been amply confirmed by others. The following is an illustrative case:

Miss A. K., aged twenty-two years, had pleurisy one year prior to coming to Colorado. Cough and expectoration had existed about six months. Dysphagia and slight aphonia had existed for about four weeks. There was rapid loss of weight, rapid pulse, slight fever, and physical examination showed active involvement of both lungs. The larynx was extensively affected, the epiglottis being pale with nodular tumefaction and large ragged ulcerations. The right aryepiglottic fold was pale and uniformly swollen.

The patient was highly nervous and it was with difficulty that a satisfactory laryngoscopic examination could be made. After one month of rest and simple palliative measures, treatment by the galvanocautery and excision was instituted. Now at the end of three months there is seen a moderate degree of tumefaction which is still slightly nodular in spots, partial destruction of epiglottis, but no ulceration or other evidence of activity. The patient's general condition is greatly improved, the physical signs showing less activity and the weight increased sixteen pounds.

Much has been said of the danger of wound infection and extension of the process. The effect of trauma in localizing tuberculosis or spreading a local lesion seems still to be a subject of dispute. Laboratory investigations have not been conclusive, for example: Pels Leusden[12] showed that "crushing of a kidney in rabbits, followed by the intravenous injection of tubercle bacilli, resulted in the preferred localization of the tuberculosis in the injured kidney to the exclusion of the rest of the body," while Corper[13] found that "crushing and the subcutaneous injection of chemical irritants just prior to the subcutaneous injection of virulent human tubercle bacilli in various-sized doses had no appreciable influence upon the progress of the infection as compared with that obtained in control guinea-pigs."

Clinically, many observers have presented instances in which trauma seems to have been a factor in etiology, as, for example, a case referred to by Walsham,[14] in which pharyngeal ulceration following the accidental swallowing of caustic potash became tuberculous in an individual suffering from pulmonary tuberculosis.

On the other hand the great number of operations performed daily on tuberculous individuals is pretty good opposing evidence.

Incision. As early as 1868, Marcet, quoted by James,[15] advocated puncture and scarification in the indurated form; little

account was taken of this until Schmidt, in 1880, advised incision with or without lactic acid rubbings. Only a few men besides the originators have used these procedures to any extent. As in edema from other causes incision is of some value, but it cannot be considered as effective for curative purposes as other measures. In the indurative form the contraction hoped for cannot be accomplished in any degree as satisfactorily as by the galvanocautery. Its use, therefore, should be confined to cases of pronounced edema.

Excision. In 1883 Schnitzler[16] removed a tuberculous tumor endolaryngeally. Since then the excision of tuberculous masses, whether as typical tumors, circumscribed papillomatous vegetations or localized infiltrations, has been common practice. Even though all of the invaded structure cannot be extirpated, as referred to above, the removal of portions thereof is attended with satisfactory healing, relief of symptoms, and is often followed by the arrest of the local lesion. This is a much more liberal view than was taken a few years ago, when many writers, including the author (1906), limited the application of this operation "to those cases in which there is a certainty or a strong probability of completely removing the entire focus of disease."[17]

The cases best suited for excision in addition to the well-localized ones are those showing few acute manifestations—in other words, the pale, irregular nodular infiltrations whose activity is manifestly sluggish. The cases presenting much red edematous swelling, submucous gray deposits of tubercles, with general symptoms of rapidly progressing disease, such as high fever, etc., are better adapted for other methods of local treatment. A good illustration of the value of this procedure is found in the case recently reported by Sir Dundas Grant,[18] in which the lesion was so extensive that the patient suffered dyspnea and regurgitation of liquids in addition to other symptoms and in which relief was obtained by intralaryngeal removal of tuberculous masses from the anterior and posterior commissures, followed by the galvanocautery to vocal and ventricular bands.

Histological examination of masses removed from tuberculous larynges has not always shown tuberculosis except when the disease, while sluggish, was still active. Infiltration, papillomatous or smooth, often persists in the posterior commissure, constituting the

principal cause of hoarseness. These masses often represent an end-result, and when removed show, according to Dr. Hilkowitz, who examined them for me, "a papillary overgrowth of the surface epithelium, the corium being the seat of a round-cell infiltration running between dense fibrous tissue."

The excision of the epiglottis in part or entire is not generally practised to the extent that Lockard and a few others do, and still its value is unquestionable. Removal of small areas of infiltration, smooth or with nodular vegetations, or ulcerations involving the free margins of the epiglottis, lend themselves readily to this operation, especially if followed up with the galvanocautery.

Amputation of the epiglottis is not as simple a procedure as one might infer. I have had one case of severe hemorrhage and two in which secondary cicatricial contraction caused marked stenosis. One often sees the under surface of the epiglottis covered by tuberculous ulcerations in which the temptation to remove the entire organ is very great, but the judicious application of the galvanocautery will usually cause satisfactory healing.

Nevertheless, epiglottidectomy is strongly advised, especially for the dysphagia when due to involvement of the epiglottis principally, and for those cases in which the tumefaction interferes with satisfactory treatment of the rest of the larynx.

Curettage. This is less practised than formerly if we exclude excision by the so-called double curette. Its value is limited to surface manipulation, thus cleansing and stimulating sluggish ulcerations. It is less useful than excision for actual removal of disease areas and less effective than the galvanocautery for the relief of pain in more acute lesions.

Galvanocautery. Of all surgical measures the galvanocautery is the most generally and favorably recommended. Its value seems well established and its future as a therapeutic agent seems assured. Voltilini,[19] in 1867, made a bold though unsuccessful attempt to establish it. Grünwald[20] gave us a refinement of technic. The names of those in whose hands the galvanocautery has given satisfaction are too numerous to mention, including Gleitzman,[2] Casselberry,[22] Iglauer,[23] Freudenthal,[24] Ruedi,[25] Killian[26] and Thomson.[27] Casselberry warned against its use except in skilled hands, being fearful of untoward results. Freudenthal speaks of

Siebenmann's experience in which the reaction was so severe as to necessitate tracheotomy.

Of course, one deprecates the performance of any intralaryngeal operation by those unskilled in laryngologic practice, and still, if not too large an area is treated at one sitting, the danger of serious consequences is extremely small.

The galvanocautery is applicable to a very large percentage of cases, either for palliative or curative purposes. Sir St. Clair Thomson[28] found it indicated in 20.22 per cent of 178 cases. In 100 private cases seen in the past few years the writer used it in 22 cases. I am firmly convinced that its use can be extended to nearly every stage of laryngeal tuberculosis after the initial period of anemia or hyperemia—that is to say, in all forms of infiltration, smooth, nodular, papillomatous; in all varieties of ulceration, small, large, sluggish, painless or painful; even in the final stage, when necrosis is involving underlying cartilage, it may relieve suffering and help clean the parts. Applied superficially its value to sluggish ulcerations in removing necrotic tissue and in stimulating granulations is far superior to chemical agents.

Applied by deep puncture to infiltrations its action is ideal, for as Wood[29] puts it, "The eschar produced by burning prevents reinfection," if this were necessary, "until the tissue has become sufficiently resistant to protect itself, sealing the lymphatics and bloodvessels." This seems a much more reasonable explanation than that of Ruedi,[30] who believes the thick slough acts as a protection—at least it is more desirable, for it does not necessitate extensive cauterization at one sitting. Wood tells us, also, that, following the actual cautery, "a retarding influence is exerted beyond the area actually destroyed by the heat."

Surgical treatment of laryngeal tuberculosis is not of itself the most important factor in the management of this condition. It has its limitations. There is no place here for extreme views and its application should have a rational basis. It is only one factor in the treatment, being a valuable adjunct to other local, general, specific, hygienic and climatic measures, besides, as Dennis[31] has said, shortening the time required to bring about favorable results.

It frequently becomes necessary to institute very mild local treatment in combination with rest, fresh air, etc., before resorting

to any form of surgical intervention. It may, however, be said that of all forms of local treatment it is the most important, being the most effective. It is valuable both as a palliative agent and as a curative measure, often being indicated for the relief of symptoms when a cure is out of the question. Operation often exercises a favorable influence on the pulmonary condition, and as Ruedi has shown, the galvanocautery has been of value in high altitudes which affected the lungs favorably, but which were without influence on the larynx.

In the above an attempt has been made to give the surgical treatment of laryngeal tuberculosis its proper place in the management of this most serious complication and in a measure definitely to outline its special indications and applicability; but after all is said, one might paraphrase Sir St. Clair Thomson's reply to a question asked of him by Drs. Cohen and Swain at the 1919 meeting of this Association: He said: "The chief thing in determining the exact condition, local and general, *for the exhibition of operative treatment* is the skilled eye of the diagnostician, because it is impossible to put down in words the conditions that one sees."

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THE TREATMENT OF TUBERCULOUS LARYNGITIS BY SUSPENSION LARYNGOSCOPY

L. W. DEAN, M.D.

In discussing the question of the treatment of tuberculous laryngitis by suspension laryngoscopy I shall speak of this procedure only as it applies to my own work. I realize that while I am able to do my best work with the larynx exposed by suspension, some others more accustomed to expose the larynx for endolaryngeal operations in a different way can do work equally well and with just as favorable results. I am fully convinced that each of us should perform endolaryngeal operations by the method with which we are most expert.

Using proper precautions, endolaryngeal operations may be performed upon the tuberculous larynx by suspension without detriment to a coëxisting quiescent pulmonary condition. At least the lung experts who keep our patients under observation cannot detect deleterious results.

During the earlier period of my laryngological career I operated my cases of tuberculous laryngitis by indirect laryngoscopy, during the middle third by direct laryngoscopy, and during the latter third by suspension laryngoscopy and direct laryngoscopy. It is certain that during the middle third results secured were much better than those of the first, and those secured during the latter third are much better than the results of treatment during the second period. This improvement in results is not entirely due to a change in the method of doing endolaryngeal work. However, suspension laryngoscopy helped very much.

One-half of our cases today receiving galvanopuncture, curettage, etc., have the work done by direct laryngoscopy. In my hands these patients do not get as good results as those that are suspended. It is impossible for me to do as accurate work by direct laryngoscopy as by suspension. I have done many more endolaryn-

geal operations by the direct method than by suspension. I cannot place my cautery or knife as accurately by the former as by the latter method, neither can I protect the larynx so well from the cautery point. As to whether the patient is to be suspended or treated by direct laryngoscopy we will discuss later.

Unless there is some contraindications to its use, suspension laryngoscopy is to me the procedure of choice for endolaryngeal operations on the tuberculous larynx. The well-illuminated larynx is thoroughly exposed. Both hands of the operator are free. He may have in one hand a spatula to expose better or to protect a certain area in the larynx and in the other his galvanocautery point, punch or curette. He is at liberty to turn to his instrument table and select, if necessary, a different instrument without interfering with his work. He may take in his left hand a laryngeal speculum and expose the upper end of the trachea, the anterior commissure or the interarytenoid space, leaving his right hand free for operative work on the part exposed. There is no hurry. I frequently demonstrate the patient to sixteen students without the patient objecting. If there is any inconvenience from the suspension it is during the first few minutes. The patient who is suspended the first time may feel that he is suffocating. The tuberculous case is particularly favorable for suspension. The emaciated neck makes the procedure a very easy one.

Suspension laryngoscopy in laryngeal tuberculosis is indicated only in children old enough to be controlled and in adults. The use of a general anesthetic in this class of cases should not be considered. This prevents suspension laryngoscopy with young children. The work is done under local anesthesia. There is no excuse for loosening teeth. I frequently attach the tooth clips to a dental bridge, using a lead protector. There should not be the slightest danger of jaw fracture. The patient should be rapidly suspended, using every precaution for the patient's comfort. To get a good view it is not necessary to separate the jaws widely. Separating the jaws too widely may add to the patient's discomfort. It is not always necessary or advisable to bring the anterior commissure into view. It is never necessary to raise the patient's head from the table. Once suspended there is no reason for hurrying with the patient.

The anesthesia—Morphin gr. $\frac{1}{4}$, atropin gr. 1-120—is given twenty minutes preceding the operation. Ten per cent cocain is applied to the epiglottis and larynx, using a cotton swab. The swab is held in contact with the epiglottis and chords until all tendency to gagging disappears.

Immediately following the operation the patient is placed in a croup tent for six hours. We have never had a postoperative edema or hemorrhage of any consequence following the removal of the epiglottis or endolaryngeal operation on the tuberculous larynx by suspension. We have had marked edema following endolaryngeal operations by the direct method and hemorrhage following the removal of the epiglottis without suspension. Suspension prevents these sequelæ by permitting of exact incision and cauterization when operating in the larynx, and so thoroughly exposes the bleeding-points that they may be properly handled.

For amputating the epiglottis suspension laryngoscopy is the procedure of choice. Under local anesthesia, using the short Lynch tongue spatula, the epiglottis is distinctly exposed. It is grasped with a tenaculum forcep and using a Lynch knife cleanly severed at its base. I have not noted any hemorrhage of importance following this procedure. It requires but a short time.

Sometimes the shortest laryngeal spatula is too long and I then substitute the long clips used by Lynch with his tooth plate for the short clips. This brings the spatula forward on the tongue and gives a better exposure. This is more often necessary when working on the lingual tonsil by suspension.

It is not within the province of this paper to discuss the indications for endolaryngeal surgery in tuberculous laryngitis.

I will try to outline my conception of the conditions under which suspension laryngoscopy should be used and try to indicate the class of cases in which it has seemed to us to be particularly beneficial.

From July, 1919, to April 5, 1921, we had in our service 143 cases of tuberculosis of the larynx: 73 received operative treatment, 37 were operated by direct laryngoscopy and 36 by suspension. Dr. Scarborough, who is in charge of these cases, reports that of those suspended all but a few secured improvement—most of them marked improvement—and a considerable number apparently

recovered. The 37 cases are those who were never operated on endolaryngoscopically except by the direct method. If we would compare the number of endolaryngeal procedures by direct laryngoscopy with those by suspension in the forty or more cases of laryngeal tuberculosis that we have under our care we would find that the number of operations by direct method would be several times greater than that by suspension. Included in the 36 cases suspended are all cases who had suspension perhaps only once. Most of our cases have work done on the larynges by direct laryngoscopy before the pulmonary expert considers them sufficiently quiescent for suspension laryngoscopy. After the first suspension most patients tell me that the suspension is not particularly disagreeable. Some patients seem always to have much subjective discomfort. As long as there is no pulmonary or systemic reaction we are not concerned with this. Suspension laryngoscopy, at least the first time it is used, is a decided strain on most patients, and there is greater chance of a reaction following its use than that of direct laryngoscopy. The decision as to whether the operation is to be performed by direct laryngoscopy or suspension is made by the pulmonary expert. He approves of suspension for those cases who can have the endolaryngeal work done in this way without much risk of a reaction. The suspension in our hands gives the best results, and if it can be used without detriment to the patient it is the method of choice. It is particularly desirable to suspend those cases needing cutting and curetting operations.

Early in our work several cases had reactions lasting for several days. Dr. Scarborough tells me these were of no importance and that no case has had a serious setback because of suspension. During the last year the reactions following suspensions have been eliminated almost completely, if not completely, by a more careful supervision of the cases. A few days ago, because of rather indefinite indications that one of our cases was not doing well, the patient was not suspended. She had a marked relapse. If she had been suspended this would have been charged to the operation.

Not only are the cases watched and studied carefully before and after suspension by the pulmonary expert, but the laryngologist gives the larynx very careful study. Three days after the opera-

tion on the larynx I go over my cases very carefully, noting just what has been the result of cautery or curettage. Then repeated careful examinations are made once a week. The frequency of suspension depends upon the needs of the larynx. Occasionally we have a case in which the galvanocautery is used under suspension every two weeks. These cases are usually ones that are discharged from the sanatorium whose larynges are scarred, the result of previous operations and the healing process, and who have returned for cauterization of suspicious small areas in the larynx.

The patients upon whom we do suspension laryngoscopy are the favorable cases. So many of them do well that we keep them together. Those who do well help the others in carrying out their long period of treatment.

The first essential thing in treating laryngeal tuberculosis by suspension laryngoscopy is to have the patient under the supervision of a pulmonary expert who has authority to say this patient shall or shall not be suspended. Only by such a procedure can serious results be prevented. I never recommend treatment by suspension. I do advise it if the pulmonary expert thinks best. The patient must be examined and approved of by the pulmonary expert each time the patient is suspended. He must be watched carefully after each suspension. At times I find that so far as the laryngeal picture is concerned six or eight cases should be suspended the next day. Frequently only one or two appear for the work. The pulmonary expert has not approved of the work being done at this time. Later when conditions are favorable the patient is sent for the endolaryngeal work under suspension.

Our tuberculous laryngitis cases are divided into four classes for treatment: (1) Those who remain in bed and receive only the simple medication; (2) those who may sit up and have applied to the larynx mild astringents and antiseptics; (3) those who receive rapid endolaryngeal surgical procedures by direct laryngoscopy; (4) those who are operated under suspension. The pulmonary expert having before him the laryngologist's findings decides in which class the case belongs. He decides whether or not the patient is in condition to have the very careful work done in his larynx which is so beneficial and which can best be done by suspension laryngoscopy. Excepting the cases for removal of the epiglottis all cases suspended

have quiescent pulmonary conditions. The endolaryngeal procedures used by direct laryngoscopy are not so extensive as are those done in the quiescent cases under suspension. Excepting an occasional case whose pulmonary condition is such as to allow them to go home, they are all in the sanatorium under the supervision of a pulmonary expert as long as the latter considers it advisable.

While suspension laryngoscopy seems to me to be the ideal condition for the performance of endolaryngeal operations in cases with quiescent pulmonary conditions, it is particularly adapted to the treatment of superficial tuberculous ulcerations of the trachea. If these ulcerations are high up, using the laryngeal spatula, these cases may be readily cauterized. If situated low down in the trachea a tracheoscope may be passed under suspension and proper treatment instituted.

Discussion on the Papers of Drs. Brown, Edson, Levy and Dean

Dr. Joseph B. Greene, Asheville, N. C.:

I wish to express my personal appreciation to Dr. Edson for presenting such an interesting paper on the subject of climate in reference to laryngeal tuberculosis. He has told us, what we have thought for a long time, that climate has no direct effect on the larynx itself but only affects it indirectly through the general health of the patient. However, he has presented in a scientific way the influence of climate on the general condition of the patient. To Dr. Lawrason Brown we are indebted for emphasizing the importance of rest to the voice in the treatment of laryngeal tuberculosis. It seems to me, however, that the general man who treats pulmonary tuberculosis is apt to pay too little attention to the laryngeal condition. The treatment of the laryngeal lesion is different from that of the lung condition in that we are unable to use local measures in one case while the larynx is easily accessible for local applications. It seems to me, further, that the treatment of laryngeal tuberculosis depends largely on the stage of the disease and likewise upon the site of the lesion. It is obvious that silence, which has been so well emphasized, could have no effect on lesions of the epiglottis and could influence very slightly, if at all, chronic infiltrations in other situations of the larynx. In ulcerations of the epiglottis there is no treatment to my mind comparable to that of

epiglottidectomy. In many cases of ulceration and infiltration I am in the habit of using applications of formalin, with a great deal of benefit to the patient. There are certain cases, however, which require the use of the electric cautery. For this treatment I am in the habit of using the indirect method, though Dr. Dean has told us of the advantages of suspension in these cases.

In conclusion, I should like to say that for the relief of pain in this troublesome laryngeal condition there is in certain cases no method comparable to that of alcoholic injection of the superior laryngeal nerve. This method was so accurately described by Dr. Fetterolf in his original article some years ago that nothing noteworthy has since been added to the literature of the subject.

Dr. George B. Wood, Philadelphia:

After listening to the very excellent papers that have been read to us this afternoon, there is only one thing in the treatment of laryngeal tuberculosis that I should like to call your attention to. There is no doubt of the importance of general treatment and that many cases will improve and may be cicatrized, when in addition to the general treatment absolute rest of the larynx is maintained. I am, however, a firm believer in local treatment if the local treatment consists in the use of the electric cautery. I do not believe that the application of medicine, such as formalin and lactic acid, does in any way affect the progress of tuberculosis, though they may do good in checking secondary infections where there is ulceration. Personally I do not now employ any bloody operative procedures because I believe that the same, if not better, local results can be obtained by the use of the galvanocautery without the risk of spreading the infection, which I believe is quite a prominent one when the punch or other squeezing instruments are used. Of late years I have even given up the removal of the epiglottis except in very selected cases. The benefit of the cautery lies not in the destruction of the tissue or tubercle bacilli but in the fact that the inflammatory reaction necessary to throw off the eschar produced by the cautery brings to the devitalized tissue a new blood supply, thereby favoring cicatrization of the tuberculous deposits in the neighborhood. That the influence of this inflammatory reaction is felt well beyond the zone of destruction I have proved by experiments on the guinea-pig. When the cautery fails it is probably for two reasons: Either the diseased area cannot be reached, or it has become so extensive that it is practically impossible to cover the whole process. Time and again I have seen laryngeal lesions heal up while the lung condition was rapidly progresssing.

Dr. Robert Clyde Lynch, New Orleans, La.:

My experience with tuberculosis of the larynx is extremely limited. I have not seen a great number of cases and have not done a great deal of work on the tuberculous larynx, so I do not feel that I have a right to enter into the opening of this discussion.

As far as suspension laryngoscopy is concerned, and that was my part in the discussion, Dr. Dean has covered the various points of that so clearly that it is not necessary for me to say anything more. I should, however, like to mention two cases that have yielded very nicely to the sun's rays, which were applied by the patients themselves at a time during their convalescence when the pulmonary lesion was entirely quiet. Suspension certainly does facilitate the ease and accuracy of the application of the cautery, as brought out by Dr. Dean. I think that the greatest number of cases of laryngeal tuberculosis that I have seen at any time were those of Dr. Dean, and in many of those cases it was almost impossible to tell that the patients had been the victims of previous tuberculous ulceration. Healing, so far as my imagination went, was beyond expectation. These cases of laryngeal tuberculosis, as far as my judgment was concerned, were remarkable. I had not seen anything at all like them.

I do not think that Dr. Dean said enough about his routine treatment as carried on in the institution that he has charge of. I saw 55 to 60 cases one afternoon, in all phases of ulceration of the larynx and in all phases of activity and quiescence of the process in the lung, and I am sure that I saw 15 that were as well as any larynx that I have looked into for some time. They were tuberculous patients in whom the process had been active, and the history records were there to show what had gone on.

In the work on the epiglottis I wonder whether Dr. Dean knew about the spatula that Arrowsmith has devised as an aid in working with the epiglottis in this location? I wonder whether in the application by means of a syringe a dropper would not be better than the use of cotton, and I want to ask whether it was thought best and safest to use a curette on an active ulceration, and whether there was not the same possibility of a metastasis due to this manipulation.

Dr. Cornelius G. Coakley, New York City:

When I began laryngology it was quite customary to make frequent applications to the wall of the larynx in various places, but I found these cases going from bad to worse, partly because they were coming to the office in the way described. I took my cue from the orthopedic

surgeons, who immobilized joints, and during the last twelve to fifteen years I have absolutely refrained from any topical applications to the larynges of any tuberculous patients. I have divided the subject into two parts: (1) The non-ulcerative form, and (2) the ulcerative form. In the non-ulcerative form most of these patients are able to go away from their homes, and it is perfectly surprising the results that are obtained by the absolute silence that these patients are recommended to employ. They come back with larynges that are as clean as any normal larynx. When they show on their vocal cords enormous thickening and infiltration, which in former years I was in the habit of letting go on to the ulcerative stage, involving the epiglottis, I now have them treated in this manner, and you would not believe the degree of absorption that results. In a comparatively short time all these cases have improved so far as their pulmonary condition is concerned. They have come back with perfect respiration and voice. In the ulcerative type you do not always get such good results, especially where the epiglottis and arytenoid regions are involved. All these patients have great difficulty in swallowing, and the greatest difficulty is in keeping up the nutrition of the patients. The thing which in my hands has given the patients the greatest relief from the difficulty and pain of swallowing has been the application of orthoform 1 grain, iodoform 1 grain, and compound stearate of zinc 1 grain. The patients can be readily taught to apply these themselves by taking the powder-blower and making a blast with pressure of the bulb during inspiration. This will carry the mixture over all portions of the lower part of the pharynx, larynx and even down to the trachea. The first two or three applications are disagreeable to the patient from the cough produced, but in a short time the application can be made without producing any cough. I believe that the compound stearate of zinc holds the orthoform and iodoform against these lesions, protects the ulcer from the streptococci that are present and limits their spread.

We have not had a chance to do very much treatment with suspension, because most of the patients that come to us are able to be put on sanatorium treatment, where I think they do much better than at home. I object to home treatment because it is difficult to carry out. The family will come in and interfere with the carrying out of the treatment. They cannot do this at the sanatorium.

I want to thank Dr. Brown for bringing so forcibly to our attention the necessity for absolute rest and non-interference on the part of the laryngologist. I think that the less you do in the way of bruising the tissue the better, although you must examine to see what is going on.

Dr. James E. Logan, Kansas City, Mo.:

The papers of Dr. Brown and Dr. Dean were very interesting to me, but I have not had any experience in suspension laryngoscopy in these cases; and, in fact, I have had very little of any experience for the last eight to ten years in the treatment of laryngeal tuberculosis at all, for the reason that, as Dr. Coakley has said, I have been taught to let them alone, and that the less I treat them and the more I advise them and get them to seek the climate that is beneficial (and that climate depends entirely on each individual case as to whether it is beneficial or not) the more these cases of laryngeal tuberculosis will improve, provided that the pulmonary condition immediately preceding it improves. I have so often taken these cases and put them into the old-fashioned prairie schooner and sent them across the plains, and in going across they have found the location in which they have improved. Most of them have been improved. To my mind the ideal treatment would be, if you could carry it out, to have a patient with tuberculous laryngeal ulceration go to the spot that benefits him and there receive treatment by suspension laryngoscopy after the lungs and other conditions have been improved sufficiently to accept that treatment. That to my mind would be the ideal method of treating those cases, but, as far as my ability to benefit them at the altitude in which I live goes, I would say that I advise against their accepting treatment from me.

Dr. E. Ross Faulkner, New York City:

I call this the irony of fate that I have the privilege of saying a few words on the paper read by Dr. Lawrason Brown. I was his patient for a year, and I think that it is largely due to his treatment by rest that I am here today. I know that he believes in rest, for he kept me in bed for a year. I had a tuberculous larynx and I had to rest it and not talk at all for three months. I am afraid that I was a sorry patient, but as Dr. Brown has the faculty of making his patients do what he wants them to, I would say I submitted to the treatment. I had numerous visitors and it was difficult for me to keep quiet all the time. One thing he kept me from, and that was from any one attempting to touch my larynx by means of suspension laryngoscopy. I do not know that I was weak enough to allow anyone to do that. There is a peculiar conviction that a man gets if he lives at Saranac Lake more than in other health resorts—which I am sure is due to the doctors who practice there—that rest is the thing necessary above all others.

The progress of these cases is very often maintained on a very delicate balance. This can only be appreciated when you live among

them for some time. They may be making good progress and their balance may be upset by some slight thing. They may do something which in a person accustomed to ordinary activity would not be of importance, but which will start them on a down-hill course, whereas otherwise they would have been taking a sure course toward recovery.

There is a word which I should like to say about the surgical treatment of tuberculosis. It is an old-established maxim that if all the focus can be removed operation is indicated; if not it is better to leave it alone. Tuberculous joints are usually put at rest. The only surgical treatment recognized was the actual cautery or complete resection of tuberculous foci. The actual cautery gives great benefit. I do not know how that should be applied to the larynx, but I should not hesitate to apply it by the indirect method. I must relate a case in which I got fairly good results.

Last September a woman, aged sixty-seven years, came to Dr. Mackenty's clinic with hoarseness, which she had had for four months. She had not lost weight. The only thing seen was an ulcer on the left vocal cord, with gradual infiltration spreading from the cord. I took it for an epithelioma. The other men in the clinic thought so too and demonstrated the case to the students. We had the Wassermann test done and the lung examined, both being negative. We did not have an *x*-ray made, but I proceeded to do a thyrotomy. When I opened the larynx and inserted my finger it did not feel like an epithelioma. However, I removed the cord, and looking at the specimen said, "I think it is an epithelioma, although the base does not appear indurated;" but it was tuberculous. After removing it I brought the edges of the mucous membrane together, leaving a ridge of tissue which afterward made a very good cord. She got quite a fair voice and the result was excellent. The patient went on her way rejoicing and is very well today.

Dr. Emil Mayer, New York City:

Dr. Brown mentioned the Yankauer dropper and said that he regretted that it was not used a great deal more than it is. It is quite routinely used with us. In my clinic it was our custom to give every patient one of these droppers, so that he could make these applications. This, which is a simple apparatus, consists merely of an elongated dropper which is held in the patient's mouth. A little strip of adhesive is placed at the end, so that the patient may know just how far to introduce it. Then you can be sure that he always has it in far enoug to reach the interior of the larynx. This invaluable little apparatus is

particularly cheap, and we should bear these things in mind. We cannot send all these patients away. They are not financially able to go any distance. We must do what we can.

The value of the galvanocautery in these cases recalls a case treated by Dr. Fetterolf. The man made his residence in New York, and he has, in addition to a laryngeal tuberculosis, a tuberculous ear. He had been treated by Dr. Fetterolf, who had applied (by the indirect method of course) the galvanocautery. It was one of the most astounding things to see that man—the epiglottis, the arytenoids and the interior of whose larynx, as the result of the condition that he had had before, were deeply involved—get a clear voice and reach a condition of well-being. On account of recurrent attacks of otitis it became necessary for him to see me from time to time, so I have seen him for about three years. Every once in a while I look at his larynx to see how things are, and if anyone wants convincing proof of the value of the galvanocautery all he needs to do is to see a case of this kind, on which I must compliment Dr. Fetterolf.

Dr. D. Bryson Delavan, New York City:

I fully agree with Dr. Lawrason Brown, Sir St. Clair Thomson and other high authorities on the importance of rest in tuberculous laryngitis. I believe, however, that local applications to the larynx in this condition are productive of much benefit.

The objects to be gained from them are threefold, namely, the removal of obstructive and irritating secretions (in other words, cleansing and disinfection) the allaying of irritation and protection to the sensitive surfaces.

In the use of local applications the avoidance of harshness or of over-treatment are imperative. The method of application is therefore important. The employment of cotton, hair or sponge applicators is contraindicated as being more likely to injure than to relieve. Cleansing, mildly astringent or sedative and oily fluids, sprayed into the larynx and the parts lying between it and the lateral walls of the pharynx and the base of the tongue, are aids which I have found of great assistance.

Moreover, I believe that cases of tuberculous laryngitis should not be trusted to locate themselves far from competent medical supervision and attention.

Dr. Edson (closing):

I have nothing to add to what I have said before, except to thank

the Association for the honor they did me in asking me to read the paper, and to say that I have learned, I think, very much more than I have brought.

Dr. Dean (closing):

The essential thing in the management of laryngeal tuberculosis is to determine the very best procedure to be adopted when the diagnosis of laryngeal tuberculosis is made. The laryngologist, unless he is himself an expert in chest work, should place the patient in the hands of an expert on pulmonary tuberculosis. In my judgment the laryngologist should then recommend to this expert the proper treatment for the larynx from the laryngological viewpoint. As to whether his recommendations should be carried out or not is to be decided by the pulmonary expert. This teamwork with the authority vested in the internist is the essential thing in the handling of laryngeal tuberculosis. The results secured in our cases by the use of the cautery—at times the curette—mild antiseptics and astringents convince me that in a certain class of cases of laryngeal tuberculosis the larynx should not be let alone. Many patients with tuberculosis of the epiglottis have received great benefit from the amputation of the epiglottis.

In answer to Dr. Lynch's query regarding the application of cocain by means of a swab: We use this method because my junior assistants get better anesthesia in this way then by using the syringe.

In answer to Dr. Lynch's query regarding the use of the punch and curette: For localized interarytenoid tuberculoma we have used the punch and the curette and cauterized the base of the lesion many times without deleterious results. The advantage of using the punch in this way is that we can eradicate the lesion with a much fewer number of treatments than if the actual cautery alone is used.

In addition to surgical treatment, all our patients receive rest of voice; cough is controlled as far as possible and certain mild astringents and antiseptics are used in the larynx. In my judgment any mild antiseptic and astringent is as good as any other. Occasional changing from one to another is essential.

MUCOCELE OF THE NASAL ACCESSORY SINUSES; TWO CASES OF PAN-SINUS INVOLVEMENT WITH RECOVERY AFTER INTERVAL OPERATIONS

VIRGINIUS DABNEY, M.D.

The terms *hydrops antri*, to designate mucocele of the antrum, *cystic dilatation* and *serous cysts of the sinus*, used loosely by the earlier observers, are to be rejected for reasons not necessary to be discussed here. In their place mucocele may be defined as the accumulation and retention of a mucous secretion within an accessory sinus, generally associated with a distention of one or more of its walls. It is frequently merely a retention cyst, but it is hardly wise to incorporate in a definition conditions and phraseology themselves already matters of dispute. I refer to the suggestion of some observers that the following qualifying phrases be added, "due to closure of the nasofrontal duct" or "following trauma" or "associated with exostosis;" whereas, in my opinion, none of these is a *sine qua non*. In fact, it has been shown that a mucocele can exist without any of these states. Moreover, we must distinguish between two forms of this condition, *i. e.*, one without tumor formation and one with it; hence, it would not do to specify in the definition that a cystic condition is an essential. Such is my feeling, but I was surprised to find that Raoult is about the only writer who thought it necessary to lay any stress on this distinction.

Mucocele is a rare condition when compared with other forms of nasal accessory sinus disease, as shown by Raoult[1] in his statement that Killian could collect only 64 in his search, and, while I have personally examined all available literature on the subject, I can make no definite estimate, as the reports are so interwoven with each other and there are so many cross-references that there is a baffling reduplication. However, it would be a very nearly accu-

rate estimate to say that 74 cases are reported in the fifty-nine articles that I have examined. These are classed as mucocele of the frontal sinus, but several cases are complicated by involvement of other sinuses. Such is the accumulation only since 1881, when Garreau[2] and Bertheux[3] first called the attention of the profession to this condition. After this there were sporadic unsatisfactory accounts until fifteen years later, when Rollet[4 5] lent his influence and energy to further investigation and reports, and to him is largely due the stimulus which the study received at this time. Since this time reports have been as frequent as could be expected in a condition as rare as mucocele, but the progress made in the pathology has been marked, despite the many phases which we cannot explain.

As might be expected it is in the etiology of the disease that we find the least definite knowledge, and, hence, the widest speculation. Some support with much eloquence the view that trauma has a distinct influence; others believe that it is the result of a chronic inflammatory process with retention of the secretion thrown out at this time, rejecting the trauma theory. In view of the history of severe trauma in many of the cases and the well-known effect it frequently exercises in predisposition to disease elsewhere in the body, it is neither remarkable nor unreasonable that it should be assigned a causative role in this instance, especially as we are groping in the dark for a cause. Moreover, a blow at the internal angular process might cause sufficient disturbance in the region of the nasofrontal duct to produce a closure of this natural exit for the secretion of the frontal sinus and even of the ostium maxillare. Especially might this occur in the young whose bones are easily bent and in whom the sinuses are small and even rudimentary. Thus, Raoult's[1] patient received a blow from a bottle at the root of the nose which left a definite tumefaction for seven years, at the end of which time the mucocele was discovered. In Jessop's[6] case a blow on the eye seemed a predisposing cause, likewise Bertheux's[3] patient had a similar injury, and Bark's[7] patient reported that a blow from a stick at the root of the nose was the beginning of the trouble. Two days after diving six times in the Seine, to rescue a drowning man, Demaldent's[8] case showed a mucocele of the frontal region. An unusual case of trauma was that of

Rollet's[4 5] patient, in whom a blow from a cow's horn on the brow ten years before was accepted as having some relation to the formation of the frontal sinus accumulation. It will be readily seen that in such cases the great objection to the trauma theory is the length of time which is shown to have elapsed between the injury and the discovery of the mucocele. This is, of course, a valid objection; but while I do not wish to be regarded as accepting unreservedly this explanation of the cause, I do not consider that it is to be thrown out unceremoniously in the investigation of etiology. Certainly, as a primary cause, as much can be said in its defence as for many of the others. Leggat[9] reports an acute mucocele resulting from a fracture of the external angular process associated with a depressed fracture of the roof of the sinus, the tumor being bluish and soft. If this was not a hematoma it would appear to have been a case of true mucocele due to trauma, and such I take it to be from his description.

The greater number of observers incline to the belief that the cause is a cystic dilatation of one or more mucous glands, or a cystic degeneration of the mucosa (as in my two cases), or of the polyps therein, and there are still others who believe that closure of the nasofrontal duct is a cause. The cystic degeneration theory is the one to which I subscribe, and I am sure that the closure of the duct exerts a causative influence at times; but it is certainly not an essential condition, as some of the cases show a perfectly patulous duct. One of my cases showed a canal wide enough to admit a large ethmoid curette, and the duct had been open for years as a result of repeated intranasal operations on the anterior ethmoid. If closure of the duct is causative, which it may be at times, what is the cause, in turn, of the closure? The effect of injury, viewed as somewhat academic if you wish, has been mentioned, but there remains the suggestive fact that the blow occurs nearly always at an age when the frontal sinus is rudimentary and the walls thin, and the anterior ethmoid cells from which the sinus is developed are exposed to the same shock; hence it is not impossible for trauma here to cause obstruction. Congenital narrowing of the duct, rendering a catarrhal inflammation obstructive, is a likely cause. A high deviation of the septum pressing well into the infundibulum, associated with an inflammatory process in the

naris on that side, was almost certainly the cause of the nasofrontal closure in one of my cases. Congenital absence of a communication between the nose and the frontal sinus has been reported by several, and is sustained by Kuhnt.[10] This doubtless would explain some of the young cases, but hardly those occurring in the aged. The presence of bony tumors or bony thickening in diffuse form in the interior of the sinus has been found by numerous writers (Valude,[11] Luc,[12 13] Barwell,[14] Manasse[15 16]) especially at the nasofrontal duct region, and constitute occasionally a cause of obstruction. Their presence, of course, suggests if it does not actually prove the previous existence of a chronic inflammatory process, an extension from the nose very probably. The bony hypertrophy on the floor of the sinus referred to by a few authors (Valude, de Lapersonne et Panz,[17] Boël[18]) is not confirmed by an equally numerous company (Raoult, Bark, Bertheux, Hallauer,[19] de Sojo,[20] Mei,[21] Silcock,[22] Spenser-Watson[23] and myself).

This is essentially an affection of the young, the great majority being from thirteen to thirty years of age. However, my two cases were twenty-five and sixty-two years of age, and I find that Hambresin[24] reports one of sixty-one years and Buys and Van Lint's[25] case was seventy-five years old when first examined by them. It may be stated as definite that the youth of those suffering from mucocele is one of the disease's distinguishing characteristics. An affection peculiarly chronic, without any demonstrable infection usually, and taking months and even years to develop its full magnitude, it is not especially remarkable that the symptoms of mucocele should be so seldom seen or felt until late. While the discussion has been concerned principally with mucocele of the frontal sinus, where it is most often seen and where its presence is more readily detected, comment is presumed to cover the similar condition in the other sinuses, *mutatis mutandis*. The symptoms are the same except those particularly affecting the eye, such as displacement and visual irregularity, as seen in the frontal and sphenoid involvement. Frontal headache, a sense of weight and a feeling that the two sides of the head are different are the most common symptoms. When tumor formation is advanced there may be displacement of the eye, diplopia or even bulging of the brow. When the antrum is involved the cheek may have the same

feeling as the brow and forehead in the frontal cases, though the teeth occasionally cause pain. Dunning's[28] case showed involvement of both frontals and a mild invasion of the antrum and ethmoid, but only the frontals gave any symptoms. Thus, Luc's[12] case, despite involvement of the antrum, gave nothing but frontal signs. So slowly and insiduously do mucoceles develop that it may be stated as true that no symptoms are noticed by the patient before the tumor formation is advanced or the retention of a large mass of mucus is established. One of my cases exhibited no signs of her trouble other than polyps and asthma for six years after the beginning, if not actual establishment, of the mucocele condition. The other showed caries of the ethmoid and polyps, with occasional asthma, for eight years after the beginning of the cystic state. A symptom, or rather sign, upon which Rollet[27] lays great stress is the presence of an eburnated mass at the root of the nose, which he says is noted by Langenbeck, Valude, Mei and Tilley. Raoult observed it in his case and says it existed for six years after the trauma up to the discovery of the mucocele. This certainly indicates an inflammatory reaction with a possible periostitis, such as a blow could readily cause, and brings up again the question of trauma as a cause. The absence of pain in most cases and the search for relief by the patient only when the deformity or sense of pressure is great are the outstanding features in the symptomatology. When the floor of the frontal sinus is thinned and pressure is directed immediately upon the globe, diplopia or fixation of the eye may be the first symptom; when the sphenoid involvement is marked there may be loss of vision, but rarely the occipital headache which might be expected. Drooping or slight edema of the upper lid is occasionally found. One of my cases showed marked loss of vision and drooping of the lids, but no double vision or fixation; here the sphenoid disease was marked. Examination of the nose rarely is of any assistance in suggesting the condition in the sinuses, as the interior is generally normal, though in de Sojo's[20] case there was seen a reddish, soft, round mass blocking respiration. Likewise, Dunn's[29] patient showed a nasal growth, pressure upon which was transmitted to the swelling at the brow. Both my cases had shown gross intranasal disease for years. However, these few exceptions but serve to emphasize the absence of intranasal signs in most cases.

The fluid found in the sinuses is generally much thicker than ordinary sinus mucus, tenacious and comes away in long worm-like masses. It varies in color, according to the testimony of different observers, being variously characterized as honey-yellow, amber, pinkish, gray, and gray with black or reddish streaks. Upon analysis it shows cholesterin, the bile pigments, fat cells and crystals (Mestrez[12]). In the cases showing definite cystic degeneration the morbid anatomy is that of such degeneration elsewhere involving a mucous surface.

As has been mentioned the progress is markedly slow and innocent, essentially chronic, and some patients have gone as long as eighteen years after the appearance of a swelling before considering it necessary to consult a doctor (Rollet[4]). On the other hand, Demaldent's[8] patient waited but eight days. While the contents of the sinus can become infected and even break down, such is rarely seen, and even gross involvement of the sphenoid does not seem to jeopardize the prognosis. Spontaneous opening of the duct and ostia and drainage have been observed with cure (Boissarie,[30] Spenser-Watson[23]), of course, only in the simple type without definite cyst formation. In a number of cases in which serious complications were unsuspected and would have developed it so happened that the sinus was opened and the impending trouble uncovered, though not always in time for a cure. Thus, Luc[13] found a meningitis and a brain abscess after nearly completing his operation, and in another case there was an exposure of the dura mater.

In the early stages when there are few or no subjective symptoms a diagnosis of mucocele is practically impossible; but later, when the radiograph is employed and the local signs in the cheek or brow are suggestive, or loss of visual power with diminution of the visual field, the diagnosis is more simple. The nature of the tumor is discovered only at operation in some cases or on tapping and examining the fluid. Occasionally it has to be differentiated from so simple a condition as lacrimal tumor (Valude, Mei), but probing of the canal should clear up the difficulty. Malignant tumors are found in this region and are not always easy to differentiate, though sarcoma and fibrosarsoma are harder to the touch, with a "knobby" feeling. Their course is much more rapid and the sub-

jective symptoms more pronounced, especially the pain. In the case of a hydatid cyst of the frontal sinus, instances of which are reported by MacKeate and Gosselin and Rouge (see Raoult[1]), the course and symptoms are so similar to those of mucocele that an examination of the contents alone would show the true nature of the growth. Likewise would dermoid cysts of the upper anterior wall of the orbit cause confusion in diagnosis, to be resolved only by puncture of the mass and examination of the fluid contents. It hardly seems necessary to mention meningocele, as this is a congenital condition, occurs only in infants and the tumor transmits the respiratory movements. It is a compressible tumor and pressure provokes cerebral symptoms (Raoult[1]). However, an *x*-ray examination alone may show the presence of a communication between the cranium and the growth or the sinus, as the case may be. Gummata can be ruled out only by the Wassermann test, while empyema will prove more difficult to differentiate than any other condition. However, with the latter the pain is greater, the skin overlying is liable to be red, the lid swollen, chemosis present often and there may be fever. In short, all symptoms are exaggerated and the patient looks distinctly ill. There may be pus in the nose in or near the infundibulum or about the posterior ethmoid region, but, again, puncture of the mass when it presents in a convenient position may be the only means of identification. Puncture, to which the French observers resort frequently, is a proper procedure under rigid precautions, but is not to be lightly undertaken, as it is certainly not free from danger.

The prognosis of mucocele is uniformly good except where it is complicated by malignancy, and there is but one treatment, in my opinion, and that is operative and radical. The Killian and the Luc-Caldwell operations are the only procedures that commend themselves to me, to be modified, of course, in the presence of unusual conditions. But the method should always be radical and the drainage well established. I mention this, as some of the writers do not open the nasofrontal duct where this seems well closed either by bone or fibrous tissue. To me this seems bad surgery and to be an invitation to recurrence, and, what is more certain, reopening of the sinus when the reinfection does occur. Their theory is, perhaps, that closure will prevent a recurrence,

as we seek to shut off the Eustachian tube infection in the radical mastoid operation, but the cases are not similar and it is yet to be proved that mucocele of the sinuses is due to infection carried through the nasofrontal duct.

Case I. Mrs. J. V. S., married, aged twenty-five years, one healthy child. Negative for tuberculosis and syphilis. Chief subjective symptoms: asthma, nasal stoppage, burning, stinging sensation in nose and forehead, frequent colds which always precipitated asthmatic seizure. Considered that her trouble dated from six years ago. For the past six months she had had repeated removals of polypi, but said that cocain poisoned her. This alleged idiosyncrasy was later found untrue, as she had been allowed to swallow the drippings from the pledgets in the nares and a very natural intoxication followed. I found that the lightest pressure over the brow on either side and likewise over the antra caused her pain. The lids were slightly swollen and perhaps there was a slight bony enlargement at the root of the nose, the symptom on which Rollet and others lay such stress. The interior of the nose showed a very pale mucosa, a high deviation of the septum to the right impinging on the semilunar hiatus, from which or at least about which was much thick mucus. Polypoid degeneration of the middle turbinate, at least what had been left of it, was plainly seen. Such was the picture in both nares. Transillumination showed both sides dark and an *x*-ray strongly suggested involvement of all the sinuses. Later I attempted to clear away some of the polypoid mass the better to see conditions, but the neurosis of the patient was so great that I was not successful. Her eyesight had been failing for some months and the vessels in the eye-grounds were found to be engorged and the blind spot much enlarged. Being reasonably sure of my diagnosis of mucocele I did a classical Killian operation on both sides. The bone was found of paper thinness over the frontal sinuses, whose interior was tightly packed with soft cysts which bulged into the bone opening at the first stroke of the chisel. Thick, grayish mucus, but no pus, was found in long, tenacious ropes. The floor of the sinus was much thinned. The nasofrontal duct on each side was found patulous, but was enlarged, of course, as one of the usual steps of the operation. Convalescence was without incident. However, a year later the right side showed signs of obstruction and it was reopened and found full of pus; so I made the duct much wider and there has been no further trouble. Six months later I did a double Luc-Caldwell operation and found the same type of disease in the

antra, but with these additional conditions: an erosion admitting the little finger-tip in both nasal walls, a similar opening a little smaller in the left external wall, marked thinning of the right external wall. This operation seems to have been as successful as the Killian, as all asthma has gone and she has no pain or discomfort except when she gets a bad cold. Nasal irrigation serves to cure this.

Case II. Here we had to deal with a nasal condition certainly of thirty years' duration, though, of course, the mucocele history was not of so long standing. This patient, a woman, aged sixty-two years, having one healthy child and one suffering with general epilepsy, gave a negative history for tuberculosis and syphilis, but insisted that she had had trouble in nasal respiration for thirty years, during which time she had had numerous operations for removal of polypi and ethmoid disease. Her eyes had been gradually failing for some years, but the chief symptom she gave was a feeling of numbness over the top of the head and a fulness in the cheeks. Asthma was also a very prominent symptom. The interior of the nares showed the effects of the surgery she had undergone, chiefly in the removal of the middle turbinates and the anterior ethmoid cells. From the posterior ethmoid and the labyrinth and from the sphenoid wall were dependent small polypi and from the semilunar hiatus thick mucus was exuding. Pressure over the frontal sinus or antrum seemed to give no pain. Headache was constant and severe. Transillumination was not satisfactory, as much bone had been removed from the interior and the picture might have misled; but the *x*-ray was confirmatory of the diagnosis of pan-sinus trouble. The eye examination showed an immensely enlarged blind spot and many tortuous vessels in the fundus engorged and very red. Her lids were somewhat swollen, but there was no chemosis. A bilateral Killian operation was done and the findings were characteristic; many cysts and much thick, yellowish, blood-streaked mucus. While no erosion in the tables was found, the cavities were enlarged and distended and a small erosion was present in the nasal process of the right superior maxilla. Just before operation the patient blew her nose rather vigorously and air escaped into the lower lid through this opening. The nasofrontal ducts were widely open, being about the only desirable result obtained by all the intranasal surgery which she had had. Four months later a bilateral Luc-Caldwell operation showed similar conditions to exist, with this further finding: half the nasal wall on each side was gone. There has been no recurrence. Searching questioning as to the type of operations she

had had and the nature of the material removed from the nose, together with the symptoms she gave, led me to consider that the mucocele had existed ten years probably, certainly eight years.

These two cases present the classical symptoms and the extraordinary features that make mucocele of the nasal accessory sinuses an interesting study. The nature of the growths, the type of secretion, the long duration and insidious development, the lack of insistent symptoms, distention of the cavities, were all present in more or less degree, and there was an almost total absence of constitutional signs so far as either doctor or patient could ascertain.

The literature on this condition is rather extensive for so rare a disease and I have appended a list of some fifty-nine contributions for the benefit of those who may wish to pursue further this study. From this number I have quoted not all, though I have read them, save the Russian article, and wish to acknowledge especially my debt to Raoult, from whose paper I have quoted freely and often.

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Discussion

Dr. Otto T. Freer, Chicago, Ill.:

Observation of the pathological changes in the portion of the turbinal wall of the nasal cavity covered by the middle turbinate (the region called by Gustav Killian the recessus frontalis), which leads upward under the turbinate to the floor of the frontal sinus, has made the method of production of mucocele of the frontal sinus, at least in the majority of cases, clear to me. It has also explained to me the reason for the frequent complication of chronic maxillary sinuitis with a succeeding chronic frontal sinus suppuration. I know that it is a text-book claim that the maxillary sinuitis is the sequel as a supposed result of drainage by gravity of the frontal sinus discharge into the maxillary antrum from above, and for a long time I accepted this idea until the knowledge that the reverse is true was forced upon me by experience which showed me that the regular sequence is dental caries, maxillary suppuration and later frontal sinuitis. The manner of production of the conditions mentioned I have found to be as follows:

The recessus frontalis is covered inwardly by the middle turbinate as mentioned. Its roof is formed by the obliquely ascending posterior attachment of the middle turbinate (Hajek's lamella of the middle turbinate), the floor of the bulla ethmoidalis and in front of this by the frontal sinus floor and ostium. Anteriorly the recessus is limited by the walls of infundibular cells. Below the recessus has a partial floor formed by the outwardly curling lower border of the middle turbinated body. As long as this floor remains partial the recessus can drain over the lower turbinate into the lower meatus. Should, however, for any reason this floor become partly or entirely a complete one the recessus obviously becomes a more or less closed cavity, its drainage becoming impeded or arrested.

The chief factor that acts to broaden or complete the recessus floor I have found to be the more or less swollen or hypertrophied uncinate process. When so enlarged it may be seen protruding beside the anterior border of the middle turbinate as a smooth body that looks like a second middle turbinate lying beside the usual one, often being in firm contact with it along its whole length. Under these conditions escape of pus from the recessus becomes very difficult, and it dams back into the frontal sinus, as it is under positive pressure. In this way the frontal sinus becomes infected by the antrum suppuration, which

has also created a hypertrophic swelling of the entire infundibular region, a swelling that may express itself by the creation of polypoid hypertrophy as well as by uncinate enlargement. Should, in the course of time, the uncinate become adherent to the middle turbinate the recessus becomes permanently a partly or entirely closed cavity, the conditions for the creation of a mucocele then being present, gradual dilation of the frontal sinus taking place with absorption of its thinnest wall, its floor, with in some cases displacement of the eye outward. I have seen two cases with this exact course of events—the frontal sinus, the recessus and the maxillary antrum forming one huge cavity containing old sterile pus that gushed forth under pressure as soon as the adhesion between the uncinate and middle turbinate was split, the bone of both of these structures having been absorbed so that they formed a bulging sac before being opened.

Dr. Cornelius G. Coakley, New York City:

It seems to me that mucocele is in many cases a bad term to apply to these accumulations in the frontal sinus. Within the past fourteen years I have had two cases that were diagnosed as mucocele. One was in a patient on whom, about ten or eleven years before, I had performed ethmoid exenteration for orbital cellulitis. The patient had been operated on a few days before by a confrère in New York. After a partial exenteration of the ethmoid this orbital cellulitis developed very promptly and demanded immediate operation. I cleaned out his ethmoid only. I exenterated the ethmoid only, like the second half of a Killian operation. The membrane in the frontal sinus was thickened and there was some accumulation of pus. The patient had asked to have very little deformity caused. I was doing, as an experiment, that type of operation, hoping to get sufficient drainage from the frontal sinus to prevent having to do a complete Killian, or radical, operation on the frontal sinus. The patient made a good recovery from both the frontal inflammation and the ethmoidal. For a long time one could pass a probe into the frontal sinus and wash it out until all secretion had ceased. He disappeared from view, owing to residence in another country, but he returned at intervals for examination, and transillumination showed that all evidence of frontal sinus involvement on that side was absent. He returned again in June, a year ago, while I was away, and consulted a confrère in New York. He had a marked bulging in his forehead, and downward and outward displacement of the globe of the eye, which condition had been going on for several weeks. The diagnosis of mucocele was made. The frontal

sinus was opened and the membrane only partially removed, giving temporary relief; but a permanent fistula, discharging pus, resulted. In November he came into my hands again and I completed the operation, cleaning out the right frontal sinus. There had been a perforation of the interfrontal septum, so that the pus extended into the left frontal sinus. The patient made a good recovery. Considerable membrane remains in the right frontal. Nothing had been touched in the left frontal. There was an inflammatory process going on in the membrane.

I had a second case in January of this year, in a nurse who had had a left frontal bulge above the inner canthus of the eye. She had been having headache and disturbance of vision, which an ophthalmologist had failed to correct. I had a radiograph made which showed a diseased area in the frontal sinus, with perforation and invasion of the border of the right frontal by this mass. She was advised to have an operation done and both frontals were opened. The material was greenish colored and thick. It was sterile so far as bacteriological examination was concerned. The gross appearance was that of an enormously thickened, chronically inflamed mucous membrane. The mucous membrane of the uninvaded part of the right frontal showed a normal appearance.

If we want to call these conditions mucoceles, all right; but I think that the pathology is that of a chronic inflammation of the mucous membrane—without bacteria present or with a low-grade bacterial content—which has become devitalized so that one cannot get a growth. For some reason—perhaps owing to the explanation given by Dr. Freer, that of some previous injury—there has been an interference with the passage of the secretion into the nose. There has been an obliteration of the nasofrontal duct, and the result is a gradual accumulation of pus with bone absorption. If you look on it as a chronic low-grade inflammatory process you can understand better what is going on in these cases. In the first case fibrous tissue had grown across the floor of the frontal sinus, so that no probe could be passed up into the frontal sinus. That I satisfied myself of three or four years before the present attack. The process had been that of chronic inflammation, where the outlet had been obstructed from some pathological disturbance—possibly inflammation and possibly trauma.

Dr. Lewis A. Coffin, New York City:

I have had some experience with these cases and they are always of interest to me—these bony cysts filled with this mucous material

which we call mucoceles. In the cases that I have had I would not say that the frontals were involved but rather the ethmoid sinuses. The interesting thing is the absolute destruction of all the natural walls of the tract and the extension and enlargement of the limiting wall of the cavity. That is the real wonder to me. I suppose it is due to the action of the osteoblasts and osteoclasts; but how they get to work and apply the thing, so that one part is excavated and the other built up so much, is altogether beyond me. I do not know how it differs from the cystic turbinate, which we find more frequently in the female than in the male, but I have seen it in both sexes. Then, again, I do not know but that it is comparable to the same cyst that we find in the jaw. We have seen cysts in the lower jaw as large as a robin's egg which had evidently started from some diseased tooth. I was wondering whether if, as Dr. Freer has suggested—the condition commencing in the antrum and spreading upward—the infection may not come from the teeth. The antrum is so often infected from a diseased tooth that this origin seems possible. The cases that I have seen generally presented a tumor between the nose and the inner canthus of the eye. Of course, this tumor was hard because it had that limiting bony wall. In one case the *x*-ray showed the existence of a mass as large as a hen's egg. When it was taken out it was found to be an osteoma.

What the chemistry is, that determines whether the growth shall be the one or the other, I do not know. What we call mucoceles are those oyster-like masses which are always sterile I think. I believe that they all belong to that class of cases known as bony cysts.

Dr. Hill Hastings, Los Angeles, Cal.:

Dr. Dabney made the statement that the existence of sarcoma with the diagnosis of mucocele is not uncommon. Some years ago I reported three cases, two of which were mucocele of the orbit and one mucocele of the antrum. In looking up the literature I found a number of mucoceles reported, some with great disfigurement of the face. The antrum growth in my report was apparently a mucocele of the antrum, but I am satisfied that it was not that but a dentigerous cyst that almost completely filled the antrum. In talking the matter over with Dr. Coakley some years afterward he told me of a dentigerous cyst in his practice that also apparently filled the whole of the antrum, and said that he thought I had made a mistake in diagnosis. In my own orbital mucoceles both were diagnosed as "sarcoma." In one the eyeball had been pushed forward, outward

and downward by this slow-growing tumor. Diagnosis of mucocele was made at operation and not before.

Dr. Joseph H. Bryan, Washington, D. C.:

I think the gentlemen are confusing two conditions: one, mucocele, and the other, hydrops antri. One of the cases that Dr. Hastings was referring to is evidently what used to be called hydrops antri. Some years ago there appeared an article in Burnett's *System of Diseases of the Ear, Nose and Throat.* In this article it was stated that there was probably no such thing as hydrops antri, but that the condition was a dentigerous cyst. Then Dr. Hermann Knapp reported a case of hydrops antri that was not a dentigerous cyst. There is a condition known as mucocele. Just what the actual pathology is I am not able to state, but undoubtedly it is an accumulation of pure mucus due to a low-grade inflammation that has not gone on to suppuration. It is caused by a plugging of the cavity and, I believe, is a pathologic condition.

Dr. Thomas J. Harris, New York City:

As bearing on the matter of the cause of the condition, and in line with what Dr. Freer and Dr. Coakley have stated, I should like to report a case of pneumatocele. The man was a Russian, aged thirty-three years, who complained of crackling in the frontal region and vague pains over the head. There was a sense of fluctuation over the mass. The nose showed distinct ethmoiditis. There was a history of considerable time in the development of the disease. No swelling was seen beneath the orbit. The *x*-ray showed a cloudy frontal sinus. Operation showed, first, a distinct air tumor with a very small opening into the frontal sinus, which was filled with pus, and a single sinus, no left sinus at all—and an occluded nasofrontal canal. It would seem that the trouble had begun in the nose and proceeded up into the forehead.

Dr. Dabney (closing):

Dr. Freer's explanation of the condition is blocking of the sinus, and this we see all the time. Dr. Coakley says that he thought mucocele a bad term to use because it did not exist, but admitted its existence later by laying down a definition of a chronic inflammatory process, which he thought a reasonable one. Dr. Coffin's description of an oyster-like mass is very graphic.

Dr. Coakley spoke of the growth being sterile. It is my experience,

and that of practically everyone, that we cannot get a growth from a culture, and this is a very interesting thing. The first case that Dr. Coakley spoke of was not a mucocele, and I doubt whether the second was.

Dr. Coffin spoke of a bony cyst filled with mucous material. It is very interesting and certainly can be classed as a mucocele. The enormous destruction of bone is certainly in line with this disease. A cystic turbinate would be a mucocele. I think that is a rational way to look at it.

Dr. Hastings spoke of sarcoma as being one of the confused diagnoses. In the mass of literature that I went over I found in the *British Medical Journal* a picture, without the author's name, under the head of "Educational Mistakes." It was the picture of a man who looked like a gargoyle. For three years this condition had calmly been accepted as a case of sarcoma, but it was not sarcoma at all but a mucocele.

I read Dr. Bryan's article on "Hydrops Antri," and I agree with him that it was the first and last word on the subject and far ahead of his time. Hydrops is not a term that should be tolerated at all. Pneumatocele is one of the terms laid down by the French. I did not lay stress on it. It is generally supposed to be differentiated by the crackling or creptitation you get on palpation.

ASPERGILLOSIS OF THE MAXILLARY SINUS

ROSS HALL SKILLERN, M.D.

Curious cases, even though rarely met with, present a certain amount of interest, as one is always in the position of unexpectedly encountering a similarity which, for the moment, remains unrecognized. Such is the history of the following, which I have the honor of presenting to you:

James B., a large man, about fifty years old, presented himself with vague symptoms referred to the left maxillary sinus. Some unilateral, apparently non-fetid nasal discharge, a feeling of fulness over the left antrum, vague head pains—entirely a typical case of sinusitis. No periods of congestion or depression and no postnasal discharge. Some cacosmia at times, but never marked.

Examination revealed a slightly congested lateral nasal wall, but otherwise normal. A needle puncture of the maxillary sinus was made and it was found considerable resistance was offered to the ingress of the normal saline solution. Being mindful of the fatalities reported by Gording[1] following needle puncture in which there almost invariably was difficulty in forcing the irrigating solution into the sinus, I proceeded with the utmost caution, watching the patient closely for the appearance of any untoward symptoms. Despite the continuation of gradual pressure nothing developed nor did any liquid escape from the nose either anteriorly or through the choanæ into the pharynx. As the resistance seemed to be lessening another syringeful was tried and almost immediately some fluid returned from the nostril on that side. It appeared slightly turbid, but no free pus was observed. After the injection of at least sixteen ounces there appeared in the washings small, white, inspissated masses which resembled cottage cheese. It immediately occurred to us that we were dealing with a case of cheesy metamorphosis of a sinus empyema, or a so-called verkäsung, which, of course, is a condition in which the purulent secretion has become sterile and begins to organize into a semisolid mass. Continued lavage, which now was returning quite freely,

brought forth a considerable quantity of this cheesy material, some of which was set aside for pathological investigation. Lavage was continued until the antrum was free, the injected fluid returning clear. The patient expressed himself as greatly relieved, saying his head felt lighter than it had for a long time.

He did not return for nearly a week, when further needle puncture and lavage were negative, the patient feeling quite well. He was to report should any of his old symptoms reappear, but as several months have now elapsed we can consider the case as cured.

The pathologic examination by Dr. Case gave the following findings:

"The specimen was small, soft and possessed no characteristic appearance that might have suggested the diagnosis. It had been placed in formaldehyde solution, so that a cultural study was, unfortunately, not possible. Following the usual routine it was imbedded in paraffin, stained with hematoxylin and eosin and examined histologically.

"As may be seen in the preparation under the microscope it consists of a close mycelial network with an occasional conidiaphore surmounted by a fanlike arrangement of conidiaspores. The hyphæ take a faint pink stain, but the fructifying bodies are yellowish in color, apparently resisting the penetration of the dye."

Diagnosis: Aspergillus, probably of the species fumigatus.

"The conidiaphores are rounded rods with a bulbous extremity, from which the conidiaspores grow like numerous minute fingers. The genus aspergillus possesses a number of species, a few of which are pathogenic for warm-blooded animals. Among the non-pathogenic forms is the Aspergillus oryzeæ, which furnishes the widely-known takadiastase.

"The nomenclature of the genus aspergillus is evidently not definitely fixed, as one soon discovers when examining the literature."

McFarland[2] gives the following species as pathogenic:

Aspergillus malignum, found in the external auditory canal of man.

Aspergillus nodulans, occasionally infecting cattle.

Aspergillus fumigatus, found in the external auditory canal and in other situations in man, and the cause of a fatal pneumo-

mycosis of pigeons, a disease sometimes transmitted to man, one observer collecting thirty-nine cases.

Aspergillus niger.

Aspergillus flavus.

Aspergillus subfuscus.

While infection of the middle ear by the various forms of the aspergillus is comparatively common, an infection of the accessory sinuses is apparently quite rare, as but four authentic cases have hitherto been recorded. All of these occurred in women and the infection was the Aspergillus fumigatus.

Dr. C. von Zarnico[3] reported a case in a woman, aged fifty years, whose chief complaints were nasal obstruction associated with much discomfort, an abundant secretion of a sickening odor and frontal headache, with at times a feeling of obstruction in the left ear. Lavage of the antrum brought forth a profuse, fetid, mucopurulent secretion containing brownish-gray masses about the size of a pea, which together formed a mass as large as a hazelnut. The infecting organism was the Aspergillus fumigatus. Great improvement was noted immediately after the first irrigation and ultimate cure after the twenty-first. He was unable to find any report of a similar infection.

The length of time required to bring about a cure in Zarnico's case was probably due to the fact that an antral empyema coexisted with the aspergillus infection, which in my case did not obtain.

Dr. J. H. Mackenzie[4] reports a similar case due to Aspergillus fumigatus. This patient, a woman, aged thirty-five years, first noticed a swelling on the right side of the face, which was relieved temporarily by a discharge of pus from the nose. The infection was later located in the antrum of Highmore, which was opened, drained and irrigated at regular intervals. Two months later portions of a membrane came away which, when examined by Dr. Flexner, was found to consist of an outer layer of round-cell infiltration, a middle one of necrotic material and an inner zone of a dense mycelial network.

In 1913 Douglas Harmer[5] reported a case before the Royal Society of Medicine of London. The patient, a lady, contracted a severe cold while motoring in an open car and developed a per-

sistent discharge of mucus from the right nostril, accompanied at times by a thick membranous, non-offensive cast of a brownish color from the back of the throat. He described it as resembling wet blotting-paper. She had violent attacks of sneezing and her general condition was bad. Headache and neuralgic pains around the right eye were occasionally complained of and she suffered from insomnia. While her temperature and pulse were normal she appeared to be toxic. The nasal mucosa was intensely edematous and the secretion very abundant.

The antrum was irrigated; no discharge appeared for a time until about a pint had been injected, when small lumps of brownish membrane began to appear in which a copious growth of the Aspergillus fumigatus was found. Various lotions were used, but she received the most relief following the frequent administrations of sodium iodide. In discussing Dr. Tilley's paper, eighteen months later, Dr. Harmer said that though relieved the patient was not cured, and he believed the ethmoid sinuses were also involved. He mentions finding but three cases in the literature, but gives no references.

Herbert Tilley[6] also reported a case before the same society stating that he had met with five cases in all. The first in 1909 was reported in the *Lancet* of that year as an endothelioma myxomatodes, but which he now believes to be a case of aspergillosis. He gives no reference to any report of the other three cases.

In the last case the symptoms were a persistent discharge of mucus and mucopus, fits of violent sneezing with an expulsion of grayish-white viscous masses; headache, with neuralgic pains in and around the cheek and eye, so severe in his first case as to interfere materially with the patient's rest. He speaks of the intense edema of the nasal mucosa with bulging of the wall of the antrum, suggesting cyst formation. A return of fluid after the needle puncture could not be obtained. His cases were operated upon by the Caldwell-Luc method, with no recurrence.

From the foregoing it would appear that in my case the infection was a recent one uncomplicated by any form of purulent process, which would account for the rapid disappearance of the infection.

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Discussion

Dr. Lee Maidment Hurd, New York City:

I saw a woman, aged fifty years, who came to me for some obstruction of breathing. She had a deflected septum and the usual signs of chronic nasal catarrh. Transillumination showed the left antrum to be dark. I washed out this antrum and got slightly cloudy fluid with strings like cotton-fiber. This fluid showed aspergillus with Bacillus pyocyaneus. She gave no symptoms of this condition whatever. Being a nervous woman she insisted on a cure. I washed the antrum out with saline and later injected it with silver. Then I opened the antrum and instituted intranasal drainage—all with no effect. There was always turbid fluid looking like cotton-fiber. I cannot remember all the different antiseptics I tried without success. At last I inflated it every day with equal parts of boric acid and aristol, and within a week it cleared up. We could not quite identify the parasite, but it was present in every washing.

CASE OF INTRANASAL ETHMOID EXENTERATION ACCOMPANIED BY UNCONTROLLABLE HEMORRHAGE: DEATH

DUNBAR ROY, M.D.

Suppurative ethmoiditis occurs by no means infrequently in the practice of every rhinologist. Nasal polypi with the accompanying necrosing ethmoiditis is a familiar picture. After all the arguments have been adduced against its use the writer is still convinced that the term necrosing ethmoiditis, attributed to Woakes, is the best general term suggestive of the real pathologic findings.

The management of these cases so as to produce a cure will tax the medical and surgical skill of the best in our profession. Whether by the use of either the external or internal operation the fact still remains that what one would denominate as an actual cure is not always obtained. All can be benefited, but many of these will not be absolutely free from some catarrhal discharge, while in others the resulting scabby condition will be most annoying, and even the destruction of their sense of smell is by no means a remote possibility. Hence, suppurative ethmoiditis must be looked upon as one of the most difficult problems for the rhinologist. It is not the purpose of this paper to discuss the various intranasal operative procedures which are used by different rhinologists, for the writer believes that he has obtained his fair share of success by the use of the snare, curette and punch forceps; but the object here is to present the record of one case in which complications arose and in which these were contributory to the final death of the patient. The more extended becomes my experience with operations on the ethmoid the more am I convinced that the exenteration of the ethmoid body is no simple procedure and should always be undertaken with the greatest precaution, and every step of the operation should be under visual inspection. The

presence of suppurative ethmoiditis compels one to have great respect for the ability of Nature to confine the suppurative process to these cells instead of there being a frequent extension of the same process to the cranial cavity. It is only after operative procedures that we are at all likely to have such an extension of the pathologic process, and it is for this reason that all operative work in this locality should be done with the most extreme caution. The fact that the literature will show a number of serious complications attending this operation, and even a few fatal cases, behooves us to consider it the major intranasal operation we are called upon to perform, especially if undertaken at the same time with a sphenoid involvement.

With these preliminary remarks the writer wishes to report a case of intranasal ethmoid exenteration accompanied by practically uncontrollable hemorrhage, followed by death upon the operating table, where extreme measures were being instituted in our effort to save the patient.

E. J. B., aged eighteen years, a strong, robust country lad, consulted me October 28, 1918, in reference to a very severe purulent discharge from both nasal cavities, which had been present for several years. He was also suffering with quite severe headaches. Family history was negative.

Examination of the nasal cavities revealed a suppurating ethmoiditis with numerous polypi. Transillumination showed both maxillary antrums clear, although both were punctured in order to be sure of the diagnosis, as also both frontals. *X*-ray plates showed practically the same thing. No blood examination was made. On the next morning an intranasal exenteration was performed on the left side. The whole ethmoid region was polypoid and soft, requiring the use of the snare, curette and cutting forceps. A good opening was also made through the nasofrontal duct and the frontal sinus thoroughly irrigated. The sphenoid was also opened because it was very soft and a curette easily entered the antrum. No packing was used and there was no undue amount of hemorrhage. In three days the patient returned home with instructions to irrigate his nasal cavities with a saline solution.

On January 22, 1919, about four months after the first operation, the patient returned for another examination. The left side appeared in excellent shape, with only a slight amount of catarrhal secretion.

Headache on that side had entirely disappeared. Over the right or unoperated side there was still present severe headaches and a profuse purulent discharge. The next morning this side was operated upon in the same manner and with the same care and thoroughness as the left. The frontal was irrigated and also the sphenoid irrigated. No unusual amount of bleeding occurred and no packing was used. The next morning the patient reported to the office and the operated nasal cavity seemed to be in good shape. He remained in the city for a few days so that I might irrigate the cavities myself. The operation was performed on Thursday. On the following Monday, four days after the operation, he came to my office late in the afternoon on account of hemorrhage from the right side. This was checked without difficulty and without the necessity of a tampon. He remained in the office for an hour, and there being no further bleeding he was allowed to return to his hotel. He was seen the next morning, also Tuesday and Wednesday, when the nasal cavity appeared to be doing nicely. On Wednesday night, about 11 o'clock, a message from the hotel informed me that Mr. B. seemed to be bleeding to death. I immediately told them to rush him to the hospital in an ambulance. This was done, and at 12 o'clock, with the assistance of a colleague, I undertook to check the hemorrhage, which was coming profusely from both sides, anteriorly and posteriorly. He had already been given a hypodermic of morphin and atropin by the house surgeon, and temporary measures had also been used. A large sterile postnasal cotton tampon was used and both sides packed tightly with sterile gauze from the front to the posterior opening of the nasal fossæ. He was immediately given 30 cc of horse serum intravenously and 1-8 gr. morphin and 1-200 gr. atropin hypodermically every six hours. This seemed to control the hemorrhage. We left the hospital at 4 A.M.

On visiting him about 9 o'clock the next morning only a slight serous bloody oozing was present. Temperature, 101.2°. Pulse, 110. Ice packs were kept over the nose and only liquid diet given. It was noted that the blood coagulated readily, giving no indications of his being a hemophiliac. Horse serum was given subcutaneously every four hours. In addition to this pituitrin, coagulose and other various remedies of this kind were used. At this time the patient was considerably nauseated and vomited blood. Orange albumen was administered with other liquid diets. There being considerable pain in the abdomen and evidence of gas accumulation, an enema was administered, which brought relief from these symptoms. In addition to the bloody serous discharge there was considerable flow of mucopus from both nostrils. At 6 P.M. some of the tampon was removed from the left side.

January 30 the patient had a fairly good night. Morning temperature, 101°; pulse, 102. Complains of severe headache, probably due to the damming back of the purulent discharge. Saline solution was dropped freely into both sides every hour. Small doses of calomel and soda were given to counteract the flatulency.

January 31 the patient had a very restless night. Morning temperature, 101.2°; pulse, 88. Aspirin administered for headache. No signs of bleeding. Patient feeling much more comfortable. Taking light diet. Evening temperature, 99.2°; pulse, 100.

February 1 the patient slept fairly well. Nasal cavity looked encouraging. At 6 P.M. the patient began to bleed from both nasal cavities. Ice compresses used. Morphin and atropin administered hypodermically. Horse serum given intravenously. At 7 P.M. both sides were bleeding freely. After consultation with my colleague, Dr. Lokey, the packing in both sides was removed and the cavities irrigated with hot saline solution. The blood clotted freely. The hemorrhage was very profuse from both sides, but by exclusion and close observation the majority of the hemorrhage seemed to be coming from the left. Nothing was left to do but to repack, and this we did with iodoform gauze postnasal and both sides of the nasal cavities. This checked the bleeding. At 9.30 P.M. horse serum was again administered. Bleeding very slight from nasal cavities and no bleeding from the postnasal space.

Sunday, February 2, temperature, 101°; pulse, 92. Patient was very uncomfortable and still some blood oozing from both nasal cavities. Tampons kept saturated with adrenalin chloride. Ice compresses continuously applied and coagulose given subcutaneously. This treatment was continued during the day. At 8 P.M. the temperature was 102° and the pulse 120. He had now started bleeding profusely again from both nostrils.

We now called in consultation Dr. W. P. Nicolson, a general surgeon. As all indications pointed to the fact that most of the hemorrhage was coming from the left side it was Dr. Nicolson's opinion that the tying of the common carotid on that side would probably stop the bleeding and that the seriousness of the case demanded radical action.

At 9 P.M. the patient was taken to the operating room and under gas-ether anesthesia Dr. Nicolson ligated the common carotid on the left side, Drs. Roy and Lokey assisting. While the patient was under the anesthetic both nasal cavities were cleaned and repacked with iodoform gauze and a fresh tampon placed in the nasopharynx. No bleeding could be discovered when the patient left the operating room,

and his general condition was very good. At 12 M. his pulse was 110, at 1.30 A.M. it was 144. Some blood oozing was from both sides.

Next day, Monday, February 3, 6 A.M., the temperature was 100.2°; pulse, 92. The patient complained of considerable pain over the right eye and both eyelids were swollen. Both eyes were kept washed with boric acid solution. The patient was quite uncomfortable and there was considerable mucopus dripping into his throat. At 9 A.M. the temperature was 100° and the pulse 90. Iced applications over the nose and eyes and small doses of calomel and soda were administered on account of the accumulation of gas in the abdomen.

Tuesday, February 4, 6 A.M., the temperature was 98° and the pulse 120. Patient was very uncomfortable. Enemas given. Patient taking liquid diet. At 6 P.M. temperature was 101.2° and the pulse 110. Packing removed from the left side of the nose. No bleeding. Patient seems much better. Greatly troubled with mucopus in the pharynx and larynx. This was removed with suction, much to the patient's comfort.

Wednesday, February 5, a saline was given. Soft diet was readily taken. Temperature at noon 101.2° and the pulse 110. Packing removed completely from the right side of the nose. No bleeding. Patient much more comfortable and able to expel the mucus from his throat. Saline solution with carbolic acid used every two hours.

February 6, the temperature was 100.3° and the pulse 106. Patient had a fairly good night. Light diet being taken. At 2 P.M. postnasal packing entirely removed. No bleeding. This gave the patient great relief.

Friday, February 7, the temperature was 98.2° and the pulse 100. Patient had a good night. Mouth and nose irrigated. Bowels moved normally. At 5.30 P.M. the external dressing was changed for the first time by Dr. Nicolson. One stitch abscessed. Small amount of seropus. Iodoform dressing and bandage applied.

Saturday, February 8, 6 A.M., the temperature was 99.4° and the pulse 90. At 6.30 A.M. hemorrhage started from the neck incision. Dressing changed by the house surgeon and the wound tightly packed, which controlled all hemorrhage. At 10 A.M. the patient had another hemorrhage from the incision. Blood clotted immediately. Dr. Nicolson again saw the patient. He was given $\frac{1}{6}$ morphin, 1-150 atropin. The wound was packed again. No signs of bleeding from the nose and throat. The patient had renewed hemorrhage in the afternoon.

At 8 P.M. Dr. Nicolson decided to place the patient under an anes-

thetic and to stop the bleeding surgically. The patient was removed to the operating room at 8.30 P.M. Gas-ether anesthetic was given by the same anesthetist as at the previous operation. Temperature at that time was 101.3° and the pulse 100. The patient took but a few whiffs of gas, when he stopped breathing. Oxygen and artificial respiration was used. The heart continued to beat for ten minutes after all breathing had ceased. Death. No autopsy was allowed but Dr. Nicolson opened up the incision on the operating table and found a most peculiar condition. All of the neck muscles and fascia were undermined and an immense cavity found filled with clotted blood. This extended even up to the chin. The suture on the carotid was firm and there was complete ligation.

Like many others I have operated upon a number of cases in which there has been very severe hemorrhage, but this was the only case in which the condition taxed my surgical ingenuity to its utmost. Knowing that the posterior ethmoid cells derived their arterial supply from the sphenopalatine, a branch of the internal maxillary, from the external carotid and from the ethmoidal branches of the ophthalmic artery, a branch from the internal carotid, we felt assured that the tying of the common carotid would take care of all the hemorrhage on the left side. This proved correct, as all bleeding ceased from the nasal cavities and all tampons were removed. But why the hemorrhage should start from the wound in the neck, and this also be so uncontrollable, is a question difficult to answer. It is, of course, unfortunate that no blood examination was made, but this was due to the fact that the blood clotted freely and we were expecting every moment to have the hemorrhage under control. Evidently a slow bacteremia had been progressing for some time, due to the absorption for years of pus from the ethmoid cells, and this had undermined the coats of the bloodvessels as well as the integrity of other body tissues. It is undoubtedly true that the immediate cause of death was the general anesthetic, but it is equally true that the same might not have produced death had there not been such an excessive loss of blood and the whole system in such an abnormal state, so that we are not entirely in error in saying that death was due to uncontrollable hemorrhage. Such cases, while unfortunate in their termination, make us realize that these extreme cases of necrosing ethmoiditis are not without their dangers.

Arrowsmith[1] reports one case in a negro male, aged fifty-six years, from whom a growth in the nose was removed by the cold snare. This was followed by severe hemorrhage, and later by repeated attacks of nose-bleed. On readmission to the hospital the left nostril was exposed by a lateral rhinotomy after Moure's method and a friable yellow mass of material which had envolved and destroyed the entire left ethmoid region and inner wall of the orbit was removed. The bleeding from the field of operation was very profuse in spite of a preliminary ligation of the left external carotid. A similar tumor was removed from the supraclavicular region, where there was also considerable hemorrhage. For this reason the patient, "already greatly reduced by his previous loss of blood," died in three hours after leaving the operating room. The nasal and supraclavicular tumors were alike in gross appearance—both hypernephroma.

Felix[2] reviews many cases of fatalities following nasal operations, and while he notes several deaths due to meningitis after the ethmoid operation he makes no mention of hemorrhage as a cause of death in these cases. These cases of meningitis are included in the following notes under the name of the author making the original report:

Dabney[3] notes three deaths following the ethmoid operation due to meningitis, but none due to hemorrhage.

Hajek[4] mentions one case in which death following the ethmoid operation was due to meningitis.

In the discussion of Hajek's paper, Lack says that in over 300 ethmoid operations he had but 1 death. This was due to meningitis. He adds that of eleven other operators using his technic who reported to him, eight stated that they had no fatalities; the other three reported 6 deaths. All were due to meningitis. Lack says: "I have heard of no death from any other cause."

In this discussion Ballenger states that he had but one death, also due to meningitis; he had never had any other complication "of any moment." He reported over 200 cases without his being called to check hemorrhage occurring after operation.

Halle[5] notes that he has performed 76 ethmoidal and frontal sinus operations by his intranasal technic. In one of these cases a meningitis developed that proved fatal. No mention of hemorrhage as a dangerous complication.

Hinsberg[6] reports 3 cases of death following intranasal exenteration of the ethmoid, all due to "infection" (meningitis). No mention of hemorrhage.

Tawse[7] reports 2 deaths from meningitis following the ethmoid operation.

McCullagh[8] advocates Mosher's technic for ethmoid exenteration. He states that Mosher has told him of 2 cases of postoperative meningitis following this operation, but not among his own cases. No fatal case of hemorrhage is noted. In regard to postoperative treatment, McCullagh says: "The principal part of the postoperative treatment of these cases is non-interference with Nature. Personally, I order no local treatment for forty-eight hours. . . . Packing should never be used unless hemorrhage demands it or the patient is so situated as not to be within easy reach of skilled assistance if secondary hemorrhage occurs."

Pratt[9] states that he has performed between 200 and 300 operations on the ethmoid. In none of these does he record a fatal or even dangerous hemorrhage. With his technic, he says, there is little bleeding.

Shambaugh,[10] after describing the technic for the ethmoid operation, says: "Most of the cases require no tampon if the patient remains at the hospital, where directions can be left for the introduction of a tampon in case secondary bleeding requires it. Occasionally one meets with severe bleeding at the time of operation which may require the introduction of a tampon. This should always be removed not later than the following day."

Ballenger[11] says in regard to hemorrhage following the ethmoid operation: "Hemorrhage nearly always attends the operation, and it may either persist or appear later as a secondary hemorrhage, though the latter is comparatively rare. By packing the nose as described this complication may be controlled. A slight serosanguineous oozing may continue for twenty-four to forty-eight hours in spite of the gauze packing, but it is of no serious consequence. If the patient is operated on in a hospital and remains there for three days it will rarely be necessary to pack the nose."

Oppenheimer and Gottlieb[12] state that blood examinations should be made prior to nasal operations, and if either the coagulation time or the bleeding time vary much from the normal the opera-

tion should not be undertaken without preliminary treatment to improve the blood condition. They report no fatal case of postoperative hemorrhage. In one case an ethmoid operation was followed by "secondary oozing for five days." The coagulation time in this case was markedly delayed.

Weinstein[13] also notes the need for the determination of coagulation time of the blood before nasal and nasopharyngeal operations.

Pugnat[14] reports 4 cases of postoperative hemorrhage that were not fatal, 2 following turbinectomy and 2 tonsillectomy. In all these cases there was evidence of cirrhosis of the liver or other hepatic insufficiency. Other investigators have found that hepatic insufficiency may alter the coagulability of the blood, and he believes that this factor should be considered in preparing for nasal operations.

Theisen and Fromm[15] report the use of horse serum preoperatively in nose and throat operations in any case in which they expected an unusual amount of postoperative bleeding either from a history of the patient or of the patient's family.

The ethmoid operation, they say, "is usually attended by profuse bleeding," but following the use of the serum there was very slight loss of blood in their cases.

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Discussion

Dr. Lewis A. Coffin, New York City:

I want to recite a case operated on in New York by a man whom everyone from New York respects. He had exenterated the ethmoid and the patient did not bleed for six or seven days. Then there was quite a profuse hemorrhage from the nose. He packed it for two days and then took the packing out, and it did not bleed. He went on a vacation. While he was gone the hemorrhage recurred, and it took place about every seven days. In August he came back and examined the case, packed it and went back to his vacation. Then the patient started up another severe hemorrhage. The assistant with whom he had been left sent the patient to the Manhattan Eye, Ear, Nose and Throat Hospital. I was sent for. The packing had been excellently done, and it did not start to bleed for some time after. They told me that the sphenoid had been opened, but I could not see into it. I probed, and found a soft mass. I put a 50 per cent solution of nitrate of silver into the nose, used a weaker solution the next day, and the patient never had another hemorrhage. In a week you could see nicely into the sphenoid. She had been almost exsanguinated and her hemoglobin had been down to 50 per cent. She has never recovered completely in this respect. I sent her to an internist in St. Luke's Hospital. I think she was bleeding from a granulomatous mass which the silver eliminated.

NEURALGIAS OF THE TRIGEMINAL TRACT AND FACIAL NEURALGIAS OF OTHER ORIGIN. IMPRESSIONS DERIVED FROM A SURVEY OF 555 CASES

CHARLES H. FRAZIER, M.D., SC.D.

One would expect a surgeon's thesis on the subject of facial neuralgia to deal exclusively with that particular type of neuralgia which responds to surgical treatment, and while I will present my operative experience with the major neuralgias, I should like on this occasion to include observations on certain other forms of painful affections of the face that are of interest both from the standpoint of diagnosis and treatment. There has been much confusion in the terminology: the terms "facial neuralgia" and "trigeminal neuralgia" have been, unfortunately, rather loosely used, sometimes to indicate merely certain painful zones in the trigeminal distribution, sometimes that specific form of neuralgia first described by J. Fothergill in 1776. Even for the latter, one finds in the literature a great variety of terms, such as "tic douloureux," "epileptiform neuralgia," "surgical neuralgia," not to speak of the terms of earlier writers, such as "trismus dolorificus," "la grande neuralgie" and so on. Major trigeminal neuralgia is the term I would propose as descriptive and distinctive, and in order that there may be no misunderstanding as to what is implied I will briefly sketch its distinguishing and characteristic features.

Appearing suddenly and without any apparent exciting cause and, with few exceptions, after middle life, a sharp, shooting, stabbing, lancinating pain is experienced at first in one of the three divisions of the trigeminal nerve, usually the second or third. The pain is likened by the patient to an electric shock, to a boring hot iron, to the tearing of flesh. The distribution of the pain has definite anatomical limitations, and without variation is referred

to the terminal distribution of the nerve involved, to the lips, gums, tongue, teeth, nose, and forehead. The pain comes as a bolt from the sky and vanishes like a shooting star. We speak of "attacks" as indicating certain periods of time during which the patient is subject to paroxysmal seizures. The attacks are of varying duration, a week or two at first and two or three in a year, but as time goes on the attacks are of longer duration and of greater frequency. I recall one unusual exception when the patient, whom I first saw at the age of eighty, had experienced pain not more than a week in any one of ten years until the last attack, which had persisted for five weeks. During the attacks there are a series of paroxysms of short duration, usually a fraction of a minute, and of varying frequency. The paroxysms may be spontaneous, but they are almost invariably induced by talking, eating, swallowing, by hot or cold drinks, by draughts of cold air, by sudden noises, as the slamming of doors, by the slightest touch of skin or mucous membrane. The face cannot be washed or shaved, the teeth cleaned, the hair brushed, the nose blown; eating or drinking is out of the question. Between the paroxysms the patient is pain-free, although complaining at times of a sense of soreness in the painful zones, and in the interval between attacks there is not a vestige or suggestion of the painful phenomena. Usually, but not invariably, patients enjoy comparative freedom from pain during the night; as a rule, sleep is not disturbed. In intensity there is nothing comparable to the pain of trigeminal neuralgia unless it be the paroxysms of tabetic crises. The pain of renal and biliary colic is of great intensity, to be sure, but controlled at least in part by morphin. Not so the pain of trigeminal neuralgia. The habitual use of morphin is presumptive evidence that the patient is not a subject of the disease under discussion. There are certain motor, secretory and vasomotor phenomena which are only of coincident interest.

This sketch, though very brief, is sufficiently descriptive for our purpose, but that there may be no misinterpretation, permit me to mention certain facts that are of value in the differential diagnosis. A diagnosis of major trigeminal neuralgia is not justified when there is an associated area of anesthesia or hyperesthesia in the trigeminal zone; when the pain is continuous and not par-

oxysmal; when in the early stages there are not intervals of complete freedom; when the pain does not correspond to anatomical zones; when the pain is not referred to the terminal areas of nerve distribution.

The most important differential diagnosis to be made is between those cases which might be said to be of organic origin and those which are functional. The latter is a term that must be accepted as quite elastic and is used to include the psychoneuroses or the psychalgias. The differential diagnosis is important, because not only will the pain in the functional case not be relieved by operation, but the patient will complain as much, if not more, after the operation than he did before. I have seen a number of these neuroses, and I regret to say have operated upon two of them.

Summary. A patient with severe boring pain in cheek, of intense degree and nine years' duration; after resection of two-thirds of the ganglion complains of as much pain as before operation, but after operation the most intense pain is referred to a new territory.

Case I (File No. 63183).—Aged fifty-two years, was admitted to my service at the University Hospital with a provisional diagnosis of trigeminal neuralgia. The maxillary antrum had been drained seven years ago, although at the time there was no evidence of infection, and had been discharging off and on ever since. A number of teeth had been extracted. The pain was described as boring, with a sense of pressure, and was referred chiefly to the region of the cheek and malar bone and occasionally to the border of the mandible. To be sure the pain was not paroxysmal in character but it was so intense that the patient was quite demoralized and pleaded for some radical means of relief. Rather against my better judgment I finally decided to operate, and inasmuch as there was no pain referred to the ophthalmic division I resected the maxillary and mandibular portions of the Gasserian ganglion.

The result was as should have been anticipated. The patient stated after the operation that he had as much pain as he had before. But note that, after the operation, the pain was referred chiefly to the brow and the temple. While he admitted the pain in the cheek was better, he was very positive in his statement that

on the whole he was just as miserable as before the operation. Perhaps it is easier to say what the patient did not have than what he did have. He did not have major trigeminal neuralgia, and the fact that he complained so bitterly of pain after the operation in regions of which he did not complain before, should justify one in stamping the case as a neurosis. Perhaps this may be a convenient term with which to screen our ignorance as to the origin of some of these obscure pain phenomena.

That pain should be a conspicuous feature of herpes zoster one can readily understand. Not only is pain experienced during the initial illness, before and after the appearance of the herpetiform eruption, but in exceptional instances it persists for many years, not only in the zoster of trigeminal distribution but in those of the intercostal nerves. Postherpetic neuralgia must be, however, a very unusual sequel of herpes zoster. I have seen but 2 cases as affecting the intercostal nerves, and but 1 case in 520 of the nervus trigeminus.

Summary. A case of postherpetic neuralgia of five years' duration, characterized by constant pain of great severity and hyperesthesia in the first and second divisions.

Case II (File No. 10213). The patient, aged sixty-six years, had had five years before I saw her herpes zoster in the distribution of the supra- and infraorbital nerves. This was followed by an attack of erysipelas. The pain was described by the patient as dull, as a "constant ache;" it was referred to the cheek, the upper lip, the ala of the nose, and when she brought her tongue in contact with the roof of her mouth it excited pain and a sensation as "though her face was going to sleep." There was a sensation as though there was a pressure in the orbit from behind and the skin in the region of the first and second divisions was hyperesthetic. While of greatest intensity during the initial "zoster" attack, it has been more or less constant ever since.

The hyperesthesia of the skin, so conspicuous in this case, I have observed as an equally conspicuous feature in the postherpetic intercostal neuralgias. Theoretically, one might assume that, of all forms of neuralgia, the radical operation on the sensory root would be peculiarly appropriate in those of herpetic origin, where

the lesion is believed to be in the ganglion. There are reasons, which I will not here go into, for questioning the soundness of this seemingly logical deduction, and on that account I recommended for my patient an alcoholic injection rather than the major operation.

The neuralgias due to tumor invasion may be confused with the major trigeminal neuralgias. The pain, should the tumor involve the root or the ganglion, is often paroxysmal and in other respects the resemblance is quite striking. There are, however, points of distinction which if not overlooked are sufficient for purposes of differentiation, chief among which, with tumors, are the objective sensory disturbances—hyperesthesia or anesthesia—in some portion of the trigeminal distribution. We have seen in our clinic examples of these neuralgias from tumors involving the sensory root, tumors originating in the ganglion or its dural sheath, tumors of the middle fossa with secondary invasion of the ganglion, and tumors (extracranial) invading one or more of the three divisions. One of the most interesting of these was a tumor of the cerebellopontile angle in a patient who for six years had undergone a number of operations on the supposition that he was suffering from tic douloureux.[1]

We see frequent references in literature to the relief of the "major trigeminal neuralgias" by operation upon infective sinuses or by the treatment of dental infection. Is the neuralgia accompanying or following sinus infection one and the same as the major trigeminal form? or, to put the question in another way—Is sinus infection a recognized and accepted cause of the major trigeminal neuralgia? I scarcely venture to express an opinion before this distinguished group of specialists. On previous occasions I acknowledge having stated in positive terms that peripheral infections, including sinus disease, played no part in the etiology. These convictions have been forced upon me by a critical analysis of my clinical experiences. On my records there are only three instances in which either at the time of my first observation or previous thereto has the patient been under treatment for sinus

[1] This case was reviewed by T. H. Weisenburg, Jour. Am. Med. Assn., May 14, 1910.

disease. I have not included cases in which sinus operations have been performed needlessly merely because no other apparent cause of the neuralgia could be found. That sinus infection gives rise to pain there is no doubt, but does it cause the "major trigeminal" variety? I suppose, in rebuttal, one might argue that my experience with the neuralgias caused by sinus infections has been limited, because the majority were relieved after sinus drainage at the hands of the rhinologist.

The following case I may quote merely because the exception proves the rule:

Case III (File No. 63910). Aged sixty-two years. Patient was referred to my service at the University Hospital by Dr. J. M. Robinson, with the following history: She experienced her first pain—a fine needle-like prickling on the left side of the nose—nine years ago. A tooth was extracted but without relief. After a year of pain in attempting to avulse the infraorbital nerve the surgeon opened the maxillary antrum accidentally and saw pus escaping. Drainage continued for two weeks and the sinus and wound were closed in six weeks. Two years later the infraorbital foramen was plugged and the antrum drained again, at first through the alveolar process, then through the nose. From that time on there had been no evidence of active infection in the antrum, but the pain soon spread to the third division. In the year prior to her coming under my observation she had had three severe attacks, a number of minor ones, and more or less continuous pain in the intervals. The attacks and paroxysms were in every respect characteristic of the major type of neuralgia. Her physical examination was negative except insofar as the roentgenogram showed a cloudy shadow of the left antrum. Even in this case the question might arise as to whether the infection was primary or accidental. At all events the pain was not relieved by the drainage operation.

What has been said of sinus infection might be said with equal force of dental infection. To be sure the majority of cases upon which I have operated have had many teeth extracted, but in many instances there has been no evidence of infection. Sound teeth have been recklessly sacrificed, often upon the insistence of the patient, but frequently I am afraid at the suggestion of the dentist, because the pain is referred to or seems to begin in one or two particular teeth.

Such evidence as I have presented or might present as to the etiology of the major trigeminal neuralgia is, I confess, of a negative character. For a hundred years and more the etiology has been a matter of speculation and we are as far today as ever from any clear-cut conception or any convincing data as to the prevailing cause. Admitting, for the sake of argument only, focal infections as factors, why should these neuralgias be more common on the right than on the left side? Why in the old rather than in the young? The following is a table showing its prevalence in middle and later life. In a series of 275 operations.

Number of cases between	20	and	30	years	of age	. . . .	9
"	"	"	30	"	40	"	"	. . . .	21
"	"	"	40	"	50	"	"	. . . .	71
"	"	"	50	"	60	"	"	. . . .	74
"	"	"	60	"	70	"	"	. . . .	71
"	"	over	70			"	"	. . . .	29

If, as I sometimes think, vascular changes, arteriosclerosis, fibrosis and a secondary anemia are causative agents, why is the disease so conspicuously a unilateral affection? Heredity has been said to play a part, but the facts do not substantiate this presumption. As a striking exception I may refer to a family under my care—a large family, to be sure, as there are twenty-two children—in which the mother and three children were victims. There have been only five bilateral cases in my entire series.

There are a great many instances of painful phenomena of the face, call them neuralgias if you will, that are associated sometimes with headaches, sometimes with hemicranias. While it does not clear up the etiology or pathology to classify them as migraine, this seems to be a common practice. I have been intensely interested in these migrainous cases, not so much so from the standpoint of the accompanying headache as from the associated exhibition of pain in the face. The vasomotor disturbances one sees in migrainous subjects as expressed by the sudden pallor or sudden flushing of the face, the pupillary dilation, the salivation, we must admit are expressions of some derangement in the function of the sympathetic system. If this be true, has the sympathetic system anything to do with the pains or neuralgias of which these people

complain in no uncertain terms? The following case will serve for purposes of illustration, although, strictly speaking, it was a case of ophthalmoplegic migraine:

Summary. An ophthalmoplegic migraine with intense pain in eye, temple and cheek, unrelieved by alcoholic injection, but immediately relieved by cocainization of the sphenopalatine ganglion.

Case IV (File No. 64302). Aged fifty-five years. Patient was sent to my clinic at the University Hospital as a case of trigeminal neuralgia. The essential features of the case were these: Ever since girlhood she has been subject to sick headaches. These headaches usually lasted two or three days, recurred about twice a month and were usually induced by excitement or fatigue. About two years before admission she had had an acute tonsillar infection to which she attributes her subsequent pains and aches. Two months later she developed a hemicrania and a diplopia and a month later violent pain in the right temple and eye.

The pain usually started in the temple and radiated to the eye; it was sharp and, as she said, "terrible at times," and would last for days at a time. There was no pain referred to the teeth, jaws, lips or tongue. The pain was aggravated by fatigue, worry and anxiety and relieved by morphin. I saw this patient daily for four weeks. There were times when she complained of headache and pain in eye and temple; times when she complained of headache alone or of pain in eye and temple alone. There was nothing revealed in a most intensive study other than the unilateral oculomotor palsy, and this, unlike most cases of ophthalmoplegic migraine, was permanent and not transitory in character.

Now it is rather interesting to note in this case that, at such times as her pains were unbearable, when I cocainized the posterior tip of the middle turbinate and indirectly the sphenopalatine ganglion, the pain within one or two minutes entirely and invariably disappeared. Can we draw any conclusion from this in building up a sympathetic hypothesis?

The relief of pain by cocainization of the sphenopalatine ganglion in this case brings to mind that pain picture out of which Sluder has constructed what he believes to be a clinical entity and to which he has given the name "nasal ganglion neurosis." I must

confess, in the five hundred odd cases of neuralgia that have come to my notice, not one conforms to the type as Sluder describes it with the dual picture of algesic and vasomotor phenomena. I might refer to the following case, which, though by no means a precise prototype, was relieved by alcoholic injection of the nasal ganglion:

SUMMARY. A patient with neuralgia of the face of twelve years' duration complained of pain in eye, nose and cheek-bone, radiating to the shoulder. Two carbol-alcoholic injections of the sphenopalatine ganglion were followed by remarkable improvement—but one mild attack in three months.

CASE V (File No. 63411). Aged thirty-four years, was sent to me by her husband, a physician, for the relief of what he thought was major trigeminal neuralgia. In fact, both he and she were prepared for and expected me to perform the major operation. She had complained for twelve years of pain in the right side of the face, radiating to the shoulder and back of neck. The pain, which began deep in the cheek-bone, was described as a steady, dull ache. There were tender points above the eye on the inner side of the nose, over the malar bone and condyle of the jaw, where the pain was severe. Occasionally there was a dull ache in the eye. The pain generally was constant and dull, though of sufficient severity to seem to warrant hypodermic injections of morphin. It was not lancinating or paroxysmal and was not referred to the teeth, gums, lips or ala of nose. She was given, at intervals of five days, two injections of the sphenopalatine ganglion. Three months later her physician wrote me: "The patient is in better health than she has been for six years; in these three months she has had only one comparatively light attack; she has gained in weight and altogether has made a wonderful improvement."

In another case, not unlike this, upon the application of cocain to the sphenopalatine ganglion there was immediate relief of the sense of pain and tenseness in the eye; to use the patient's words, she felt as though the tension in the eye had been relieved instantaneously as by the cutting of a taut string. Two alcoholic injections of the nasal ganglion were given, but without any substantial relief up to the time the patient passed from my observation.

If time permitted I could cite numerous other examples of neu-

ralgia of the face of obscure origin, quite atypical if compared with the picture of "major trigeminal neuralgia," but these examples will suffice to illustrate the points of distinction. In many there are attacks, but in the attacks the pain is continuous not paroxysmal. In the majority pain is referred to the eye, or rather the orbit, to the temple and to the region of the malar bone; not, mind you, to the terminal distribution of the trigeminus, as the teeth, tongue, lips and nose. There are, in some, associated headaches or hemicranias; the pain is not described as shooting, darting, lancinating, but as burning and boring, sometimes throbbing, and often with a sense of tension or pressure in the tissues. Many of these patients are relieved in part at least by opium derivatives: some are drug addicts. One can find no apparent cause, either local infection or systemic disorder. In a number I have found that cocainization of the sphenopalatine ganglion controls the pain almost immediately, but what the significance of this may be I am at a loss to say, unless we acknowledge the sympathetic system as a factor. Certainly treatment directed to the trigeminal tract is of no avail.

I scarcely venture to enter upon a discussion of the role of the sympathetic system as a factor in the etiology of neuralgias. The subject is not a new one, to be sure, but interest in it has been revived by the observations during the war, particularly as to the relief of the pain of causalgias by the Leriche operation—excision of the periarterial plexus. In discussing pain of sympathetic origin in different regions of the body Tinel[1] describes a case in which, among other sensory disorders, there was an intense burning sensation, paroxysmal in character, referred to the head, neck and shoulder. This burning pain, so characteristic of the causalgias, is quite common in the facial neuralgias that are not of trigeminal origin.

Not long ago I denuded the carotid artery of a patient from whom previously I had removed the Gasserian ganglion. Despite the fact that there was total anesthesia in the trigeminal zone the patient continued to suffer intensely from pain in the region of the mandible.

[1] La Médecine, February, 1921.

SUMMARY. Following the persistence of pain after a Gasserectomy, the common and external carotid arteries were denuded of their plexus but without any appreciable effect.

CASE VI (File No. 63906). Aged thirty years. Patient was admitted to the University Hospital November 10, 1917. Prior to admission the inferior dental nerve had been removed and an ineffectual attempt made to remove Meckel's ganglion. November 24, 1917, I excised the Gasserian ganglion. January 20, 1920, he returned complaining of as much pain as before, referred almost altogether to the region of the mandible. At the suggestion of Dr. Spiller I excised the superficial cervical plexus but to no avail. The patient was made the subject of an intensive study by Dr. A. H. Woods, who made the following notes: There is a steady pain in the right lower alveolus and paroxysms of electric-like pain which shoot into the alveolus and angle of the mouth. These paroxysms may be started by apprehension of interference, by scraping, rubbing, pinching or sticking the face or adjacent cervical areas, as well as by pressure over the right cervical sympathetic trunk. There has been recently a ciliospinal paralysis, with angioneurotic edema of lips and eyelids. Because of the latter phenomena, because of the tenderness over the trunk of the cervical sympathetic and because of the apparent existence of afferent fibers (paroxysms of pain being excited by rubbing, pinching or sticking the face) Dr. Woods proposed a denudation of the arterial plexus of the common and external carotid arteries. This operation was practised but with no appreciable effect upon the pain.

Before passing on to the question of treatment, let me summarize briefly this rather discursive presentation of our observations upon types of neuralgia. We recognize, first of all, a definite clinical entity in what we prefer to call "major trigeminal neuralgia," the symptoms of which are so characteristic that a diagnosis can be made that should admit of no discussion. The etiology is still a matter of speculation. We recognize other neuralgias in the distribution of the trigeminal nerve that have a specific cause, some of them simulating the major type, such as (1) the neuralgias due to tumors involving the sensory root, the ganglion or its several divisions, or (2) the neuralgia following herpes zoster. We recognize a third group of neuralgias, involving chiefly the ophthalmic division, that we believe to be of toxic origin; symp-

tomatically they have nothing in common with the major type. We recognize a fourth or miscellaneous group in which the pain, though of great intensity but not paroxysmal, is referred chiefly to the orbit, temple and cheek, sometimes to the neck, associated frequently with general headache or hemicrania; a group in which our suspicion has been aroused as to the part the sympathetic system may play in its origin. Finally, a group which we classify under the psychoneuroses or psychalgias.

I have led the reader through this maze of miscellaneous pain phenomena and cited so many cases with a definite purpose: I wanted to leave in the mind of the reader a very definite impression, in the first place, that there are many forms of neuralgia, and, in the second place, that the picture of major trigeminal neuralgia is so sharp and distinct that it should not be confused with other forms. The diagnosis is of vital importance when we come to consider the treatment, for what may be meat for one is poison for the other.

In discussing the treatment of major trigeminal neuralgia I should like to restrict my remarks chiefly to my experience with the major operation. Of these there have been 221 avulsions or sections of the sensory root, 5 complete excisions of the ganglion and 5 partial excisions of the ganglion.

The major operation has long since been robbed of its terrors; the mortality, once 5 per cent, has been reduced to less than 1 per cent; there having been but one operative fatality in the last 194 cases of my series and none in the last 104 consecutive cases. One might say the method of its performance has been standardized. At one time or another I have introduced certain variations, to which I will refer in passing. For a while I substituted section of the root for avulsion, but to no advantage. In a few instances I have left intact the inner fasciculus of the sensory root, when the ophthalmic division was not involved, in the hope that by so doing trophic keratitis might be avoided. I am now awaiting the results. In the course of time, should there be any recurrence in this series, this modification will have to be abandoned. Latterly I have been able to conserve the motor root and thus prevent the atrophy of the temporal muscles which hitherto interfered with a perfect cosmetic result. This

modification, furthermore, now makes it possible to operate on both sides in bilateral cases. All the technical difficulties have been mastered and the operation is now one of the most satisfactory the neurosurgeon is called upon to perform.

In the vast majority the patients, as one would anticipate, express complete satisfaction with the results; in fact, they are effusively grateful. There are, however, some exceptions to which I should like to call attention:

To a few the anesthesia is a source of annoyance. While the majority soon become accustomed to and disregard it, occasionally one sees a patient who, strangely enough, does not seem content with substitution of numbness for pain. One wonders sometimes whether in this case the pain before the operation was as violent as represented.

In a few instances when mistakes were made in diagnosis, as in a case already recorded, the patients have complained of pain as much after the operation as before. Fortunately the number is small. But there remains a small group in which, while relieved of the pain complained of before the operation, the patients have developed certain sensory phenomena that cause them anxiety, chiefly because they interpret these as forerunners of a recurrence. Some of these sensory phenomena I have called paresthesias, such as creeping, crawling or itchy sensations. Sometimes a painless impulse shoots down the path of the aforetime paroxysm. In other cases, though, and these are more interesting, the patient complains of a burning sensation, sometimes in the mouth, sometimes in the cheek; nothing that simulates in the least degree the original attacks and not observed (and this part I want to emphasize) before the operation; in other words, a new pain phenomenon. The examination finds, as one would expect after the radical operation, total anesthesia in the trigeminal distribution. This is the most puzzling of the problems that confront us. What is the cause of these sequelæ, these peculiar sensory phenomena, for they are in no sense recurrences?

In a few instances the patients state that hearing is not as acute on the side of the operation. In every instance, when possible, I have insisted upon the patient consulting the otologist, and, without exception, the report is received that hearing is as acute in one

ear as the other. There is a subjective sensation of fulness in the auditory canal, such as we might have if the canal were tamponed with cotton. I have been at a loss to explain this "subjective" sense of deafness, nor has any explanation been offered by specialists whom I have consulted. This is a subject that is presented to you for discussion.

In a certain percentage of cases, about one in ten, there develop trophic lesions in the cornea. These usually appear on the second or third day, occasionally later, but in only three instances have the lesions not responded to treatment and in two of these it has been necessary to keep the lids closed at their midpoint. In both instances the cornea is intact. Whether of advantage or not, we have adopted in our technic, preparatory to operation, a course of treatment for two days which includes instillation of atropin and holocain. These with a boric acid wash and a protective shield are continued for a week after the operation. Any destructive lesion of the cornea may be prevented invariably if, upon the initial signs, *i. e.*, the exfoliation of epithelium, readily detected with a fluorescin stain, the lids are closed. Within twenty-four to forty-eight hours the corneal defect will be entirely repaired. We should not make light of this complication. While it is recognizably unavoidable in a certain percentage of cases, it is a gratification to know that if intelligently treated there will be immediate repair of the defect.

One of the most puzzling complications of the major operation is a transitory facial paralysis. Every surgeon who has operated upon any considerable number of cases has had his experience with this complication. My own includes altogether 7 cases. In the first fifty operations there were 3; in the second fifty, 4, and in the last 138 there have been none. The paralyses are always transitory and do not appear until the second or third day after the operation. They are peripheral, not central, in type. I am still at a loss to account for them. It so happened that since I discontinued the use of a self-retaining retractor which forcibly separated the margins of the wound this complication has not occurred. Hutchinson attributed it to the detachment of the dura mater from the petrous bone, thus permitting blood to enter the small openings leading to the aqueductus Fallopii.

The surgical problems of major trigeminal neuralgia have been mastered. Granting no errors in diagnosis, satisfactory results are assured. Apart from our ignorance as to the etiology there is little left for the investigative mind and our attention should now be directed to that miscellaneous group of atypical cases. Should a clear case be made out for a sphenopalatine ganglion type, permanent relief will come only when the ganglion is excised. Alcoholic injections are useful for diagnostic purposes and are only of temporary expedience. My assistant, Dr. Grant, recently has elaborated a method of approach which, I believe, will render excision of the ganglion a simple, practical, surgical problem. The part which the sphenopalatine ganglion plays in the etiology of these atypical forms cannot be definitely determined until the total excision of the ganglion has been practised in a series of properly selected cases. In this problem and in the investigation of the part the sympathetic system may play lies the most fertile field for future research.

Discussion

Dr. Greenfield Sluder, St. Louis, Mo.:

I feel that I owe a debt of gratitude to Dr. Frazier for this clear exposition of major trigeminal neuralgias, as I never understood them so well before.

In the course of Dr. Frazier's paper he spoke of the upper paranasal sinuses in all probability not being the cause of trigeminal neuralgia. I have seen three such cases—at least three that I thought were such cases. One was sent to me by Dr. Halsted, who can tell more of the story than I of sphenoid suppuration, on which he operated and got relief for a year. Then the pain returned and it ultimately came to a Gasserian ganglion operation. I had a case of tic douloureux that was relieved by operation on the sphenoid. This was only a short while ago and may be considered as not finished. He may have further trouble. I have another case that was relieved some years ago and has not returned, but my experience with trigeminal neuralgias, as described by Dr. Frazier, is negligible. That is, my own experience. I have, however, repeatedly seen what I thought was nasal ganglion neuralgia exhibit a sticking pain. One of these was a case seen by Dr. S. I. Schwab, of St. Louis, in which the pain was as recurrent and sharp as in the trigeminal neuralgias. It was a lower-half headache,

i. e., pain, about the eye, the upper jaw, the teeth, the ear and the mastoid—worse back of the mastoid, with a point of tenderness there —the shoulder-blade, the arm, the forearm and fingers. It repeatedly proved to be controllable from the nasal ganglion. Injection of alcohol relieved it for a year and a half. Then an attack of coryza reëstablished the pain and it passed off in the wake of the coryza. Later he developed another coryza which reëstablished the pain and it did not pass off. It was injected a second time and the patient has not yet had a recurrence, (five years).

I must designate these cases as relieved. It cannot be a cure as the posterior-root section practised by Dr. Frazier is a cure. That is a break in the nerve transmission, and once broken it cannot be re-established. Pain of nasal ganglion origin can always be reëstablished by virtue of the fact that the ganglion remains in the tissue superficial to the nose and may be irritated again by inflammation in the nose.

The question arises whether the sympathetic plays a part in atypical cases. It seems to me that the sympathetic must be assumed to play a part because there is nothing else to serve as the nerve connection. Dr. Cushing, last summer, gave three papers: one published in the *American Journal of the Medical Sciences*, one in the *Journal of the American Medical Association*, and the third in a later issue of the same journal. In these articles he spoke of this lower-half headache and mentioned a case in which the pain was from the major neuroglia of the trigeminus. He expressed to me in conversation the opinion that these were all "spilled over" from the trigeminus, and he put in the text the view that there is no reason to assume that the nasal ganglion is responsible for this symptom-complex. He thought that it was more rational to assume that the second division of the fifth nerve was the origin of the pain and that it was spilled over. It is impossible for me to understand how these can be cases spilled over from the trigeminus. He showed me some of these cases in the beginning of my observations in 1909. I had seen enough to justify me in describing it, but my experience was that of a beginner and I did not understand the cases at the time; and I do not quite understand them now. A woman from whom he had removed the Gasserian ganglion had a violent headache with sphenoiditis, and I opened the sphenoid, with instant relief from the frightful headache. I tried to open the sphenoid by a comprehensive opening but could not get through by my customary technic because the bone was so thick and hard. I used an eighth-inch drill and succeeded, but that small hole closed up in a few days. She would not accept comprehensive

surgery. Some time later I heard that she was suffering about as much as before. That pain was not spilled over from the trigeminus because the trigeminus was gone. Dr. Schwab advanced the idea that these cases were explicable by virtue of segmental overlapping. These cases cannot be explained by a segmental overlapping, however, it seems to me, when the trigeminus was no longer there. If the origin of the pain was in the trigeminus I think the trigeminus would have to be intact.

Dr. Frazier spoke of ophthalmoplegic migrain. I do not believe that he connected ophthalmoplegic migrain with the perinasal cells. I have a dozen ophthalmoplegic migraines in which the sphenoid was operated on with relief. To my mind these cases are explicable by virtue of thin bone, which separates not merely the optic nerve, but also the third, fourth and sixth nerves. The anatomy of this situation was given to this Association, I think, in 1912. If these cases, then, be of sphenoidal origin and explicable by the thin separation of the lining nerve trunks, they can readily recur for the same reason that established them in the beginning. You cannot change the thickness of the bone separating them or give more protection to the adjacent nerves.

Dr. Frazier spoke, also, of pain that was stopped by cocainization of the sphenopalatine or nasal ganglion. The fact of pain transmission then arose in my mind. The question of the sympathetic comes in, and it seems to me that, as no other nerve connection is available, it must then be assumed that the sympathetic, if not under normal conditions at least under abnormal, becomes capable of afferent transmission. The literature on the subject of the possible sensory attributes of the sympathetic is very extensive. In one text that I am familiar with, by Max Buch, published in 1883 or 1885 at St. Petersburg, it is stated that while the insensibility of the peritoneum is usually admitted, yet it may be irritated and the exceedingly great pain produced by it easily recognized. The literature is sprinkled profusely with statements regarding the sensory attributes of the sympathetic system. I have been interested in that subject for some years and have made some efforts to determine the origin or authority for that statement. I have written to various men who have used the statement, but have never been able to find out who primarily attributed sensory attributes to the sympathetic. Herrick, in his *Introduction to Neurology*, speaks of the sensory attributes of the sympathetic, and at the end of his chapter he gives a considerable list of bibliographic references. Many of these are extensive monographs, the reading of which would be exceedingly laborious, to say the least.

Somewhere, perhaps, in his bibliographical references there may be found the origin of the statement of the sensory attributes of the sympathetic. Many anatomists have described clearly the sensory fibers transmitted by the sympathetic whose cell body was located in the posterior root ganglion. That may be the origin of the sensory attributes of the sympathetic. It seems to me that this is the only explanation that we can offer at present.

Dr. Frazier spoke, I believe, of a sharp, stabbing pain from the touch of the finger in the affected region. I understand that. I have had it in my own cranium and know the sensation. I had a lower-half headache some years ago which harassed me to the point of cocainization, though I dislike cocain intensely. The touch of the cotton applicator produced a sharp, stabbing pain throughout the lower half.

I am grateful to Dr. Mosher for his indulgence of one minute more, which I shall employ to ask Dr. Frazier whether he feels convinced that the removal of the nasal ganglion for a clear-cut lower-half headache will be as satisfactory as removal of the semilunar ganglion for a trigeminal tic? I have thought on this subject and tried to remove the nasal ganglion through the nose, but gave it up because, when I learned the story of the hyperplastic sphenoid, I found that an entire lower-half headache could be produced from the sphenoid. The trunks supplying the ganglion come through the foramen rotundum and the Vidian canal in the body of the sphenoid, which are superficial to the sphenoid cavity. I gave up the idea of removing the nasal ganglion when these ideas came to me.

Dr. E. Ross Faulkner, New York City:

I feel somewhat abashed in attempting to discuss the work of a master. I do not think that anyone in the world today knows as much about the subject as Dr. Frazier. He has established the surgical procedure and has shown the world its great value in relieving suffering. Also, he has reduced the mortality from over 22 per cent to less than 1 per cent. The thing is worth going to Philadelphia to see. I have been down on his list for a month, to be notified when I can have an opportunity to see this operation.

There is little that I can add to what he has said. I agree with nearly all that he has said. I started studying the disease seven years ago, to see what could be done for the cases by means of alcohol injection. I have had an opportunity to observe many cases and have tried to find out the causation, but so far have been able to arrive at no definite conclusion.

I know a noted pathologist who has this disease, and we have discussed it. The only conclusion that he can come to is that it is caused by some absorption from the intestinal tract. There is something that offers a little evidence for such a conclusion. Dana, some years ago, writing on tic douloureux, made the statement that a case of less than two years' standing can be cured by castor oil. I thought that there might be some truth in it, and in the cases that came to me I tried it. To my surprise some got rid of the pain for quite a long period. One case I have not heard of since, and I know I would have if there had been a recurrence. The method employed is almost as severe as operation. He gave it every night. I gave it every other night for ten days or two weeks, and gave, along with it, glycerophosphates; but I believe that the castor oil was the thing that produced the benefit. It is by all means worth trying, and there is no doubt that some cases will get rid of the pain from that treatment.

The etiology of this thing has been very much of a mystery and I could get no clue at all to it. It occurs in all classes, the poor as well as the rich. My patients were all of the former class and not the latter. I suspect that the latter class have gone to Philadelphia. It occurs in the fat and the lean and in people who have no diathesis at all. The fact that the patients bear this severe pain with equanimity makes me think that they are not of the neurotic class.

Another thing that impressed me is the confusion in diagnosis. Many of the cases sent to me for tic douloureux very often bore no resemblance to that condition. Patrick says that if the pain lasts longer than ten minutes it is not tic douloureux. I have seen some cases that did last longer than that in the later stage of the tic douloureux, but it rarely lasts over a minute.

Dr. Frazier mentioned twenty as the lowest age that he had seen the condition. I have seen it in a man of twenty-two, in whom it was entirely confined to the lingual nerve. I did an injection of the third division and he got rid of the pain entirely.

I want to say another word about the alcohol injection. That many of these cases will come to the major operation there is no doubt, but as the alcohol injection is much simpler I think it should be tried first. When I attempted the treatment of these cases I was anxious to look into the question of sinusitis as an etiological factor. I cannot say that I found it to be a constant association, although most of these patients had been operated on for sinus trouble. I could not, however, find that they were any more prone to sinusitis than were other people.

The method of injection which I employed was practised for a long time by splitting cadaver heads and picking out the nerve. I felt that injection around the nerve was only temporary in its results, and that if I could get into the nerve there would be more hope of a permanent cure. I found that I developed more skill in getting in than I now have. I used to get into the third division practically every time. I have plenty of witnesses to that. By employing a sharp needle with an abrupt bevel to it I was able to press it into the nerve. I then injected three or four drops of 1 per cent cocain for the institution of anesthesia. If I got an immediate anesthesia I knew I was in the nerve, and I then injected the alcohol. Not more than ten drops of alcohol were used for that sort of injection. In a large number of these cases there were permanent results. I have six cases at least that have never come back. The majority come back within a year or even six months.

In the second division I have not had permanent results so often. You cannot get into it so easily but must put the alcohol around the nerve. In the third division, however, you can do so and work easily into the substance of the nerve and get complete anesthesia with the alcohol. The good results secured by this method justify its being tried in all cases in the third division especially. All cases should be treated with castor oil first, and then if this fails, and they are confined to the third division, inject alcohol into the nerve. Continue to do so a number of times until you get in. With the first or second division it is more difficult to get that result. I had two cases in the first division alone in which I did the ganglion injection with alcohol. I should not recommend it as an orthodox procedure, because if the direction of the needle is not right you might get into the cavernous sinus or the carotid artery.

The ganglion injection I do not believe should be considered at all, considering the low mortality from the operation in the hands of a surgeon like Dr. Frazier.

Dr. Frazier (closing):

Already I have been allotted more of your time than I deserved, but there are two or three things that I should like to say in closing. I must take exception to a remark that Dr. Sluder made. He spoke of a "low-grade tic." There is no such thing. In the genuine major neuralgias the pain is always violent. If the pain is mild it is not major trigeminal neuralgia or tic douloureux, as you choose to call it. We must recognize the distinction between this major form of neuralgia

and the other neuralgias, otherwise great confusion will arise in our discussion and writings.

I hope you will not feel that I have spoken too positively. I have tried merely to relate what has been my personal experience in the comparatively large number of cases to which I have given a good deal of time and thought. There should be the freest interchange of thought between your branch of the profession, the neurologists and the neurological surgeons.

I am not prepared to say yet whether sphenopalatine or nasal ganglion neurosis is a definite clinical entity. At all events I do not like the term "neurosis" given to it by Dr. Sluder. A neurosis implies a lesion of functional rather than organic origin. In the major trigeminal neuralgia we have a definite, clear-cut clinical picture, in the diagnosis of which there should be no differences of opinion. It is sharply distinguished from that other form of neuralgia to which so much of the discussion has been directed this afternoon. That this sphenopalatine neuralgia is of sympathetic origin I think is likely. Alcoholic injections of the sphenopalatine ganglion are not comparable to injections of the Gasserian ganglion or its divisions. There are technical difficulties in the former which do not pertain in the latter. The final solution of this problem will come only when it becomes possible to excise the sphenopalatine ganglion. If this proves, as I think it will, to be a feasible surgical procedure we will then be able to state definitely whether or not the sphenopalatine ganglion plays any part in these atypical neuralgias.

I did not touch upon the subject of alcoholic injections in connection with the treatment of trigeminal neuralgia. It is a large subject in itself. Every patient should have the benefit of an injection if he wants it, even though it affords but temporary relief. I never urge one or the other method of treatment upon the patient, but, laying the facts before him, allow him to choose as between the injection and the major operation. In nine cases out of ten, if he has been a sufferer for a year or less, he chooses the former; if he has been a sufferer for three or four years he invariably chooses the operation. It is merely a question of endurance.

I cannot agree with the statement of Dr. Faulkner regarding the variations in the period of relief after injections of the second or third division, nor can I agree with him altogether in regard to his prohibitive attitude toward injection of the ganglion. I have in certain cases injected the ganglion both in very old people—when there was a very definite contraindication to the major operation and the ophthalmic

division was involved and in cases of carcinoma involving the face and the buccal cavity. Particularly in these cases of malignant disease are injections of the ganglion positively indicated. To my mind it is a most humane therapeutic measure. The patients are often in abject misery; unable to eat or speak or sleep without pain, they soon present a pitiable picture. A successful injection of the ganglion gives them a large measure of relief.

In accepting the invitation of your President to speak here today, I did so with no thought of making a contribution to your *Transactions,* but rather for the purpose of getting useful information. My time has been well spent.

NASAL TUBERCULOSIS

WILLIAM B. CHAMBERLIN, M.D.

That nasal tuberculosis is an unusual type of infection is undoubtedly true; that it is far more common than is generally supposed and can be looked for in the experience of almost every rhinologist is the firm belief of the writer. In 1911 he reported two cases before the annual meeting of the Ohio State Medical Association. These cases were subsequently published in the *Ohio State Medical Journal* and in the *Laryngoscope*.

During a series of years some ten or twelve cases were seen in dispensary practice, the diagnosis in each case being confirmed by microscopic examination. As accurate records in regard to these cases are not available they are not embodied in this report. Three cases occurring in private practice, together with full data regarding them, are herewith recorded.

Description. Confusion still exists in regard to the terms tuberculosis and lupus. Most writers regard the latter term as a relic of the days before the tubercle bacillus was recognized as an etiological factor, common to both processes. Others attribute the persistence of the term to the attitude of the dermatologists in applying it to a tuberculous lesion of the skin, with which a nasal involvement is often associated.

Killian, in discussing Lennhoff's paper, still insists on the use of the term lupus, inasmuch as the nasal form is always attenuated and characterized by great chronicity. Not infrequently a lupus of the face is simply an extension of a similar process in the nose. This form he considers relatively common, whereas the rapid form, with extensive ulceration, is exceedingly rare, Killian having seen only one case. The vast majority of authors, however, have entirely abandoned the term lupus and speak only of nasal tuberculosis.

There is also great diversity in the description of the growth.

Onodi divides the process into three groups and speaks of the (1) infiltrative, (2) ulcerative and (3) proliferative types. Freer adopts a still wider classification, common to many authors, the (1) ulcerative, (2) the solitary tumor form, (3) the diffuse swelling and the (4) granulating, progressing superficially; while Körner describes the (1) circumscribed tumor, (2) the diffuse infiltration of the membrane and (3) lupus. The line of distinction between the two latter forms does not seem exactly definite or clear. Possibly the least confusing and simplest classification is that of Zarniko. This classification is adopted by most authors. Zarniko speaks *only* of nasal tuberculosis, which he classifies into two main groups: (1) The ulcerative, occurring as an end infection in emaciated individuals and complicating a preceding process in lungs, pharynx or larynx, and (2) the tuberculoma or proliferative type, usually regarded as primary, and met with in strong, robust individuals giving no other evidence of tuberculosis. The divisions made by others he regards merely as variations under the latter group.

Symptoms. Individuals with nasal tuberculosis, as a rule, seek relief on account of nasal obstruction. Usually this is the chief if not the only complaint. In addition Körner mentions purulent secretion, often accompanied by slight bleeding and a tendency to crust formation. Such cases are accordingly rarely seen early, but only after the process is fairly well advanced. Practically all of my own cases have consulted me on account of nasal obstruction, though more or less secretion has usually accompanied this. Bleeding and crust formation have rarely if ever been mentioned. Pain is rare, except in the ulcerative form.

Appearance and Location. The growth, as a rule, is situated on the anterior part of the septum and is usually unilateral. It was bilateral in one of my cases only. Out of 164 cases Mygind reports 77 per cent as occurring on the septum. Next in order are the inferior turbinal, the nasal floor and lateral nasal wall. Körner describes syphilis as a process peculiar to the rear of the nose, tuberculosis to the anterior part, the extension to the rear, or bony framework, being secondary. One dispensary case I remember as occurring on the anterior part of the inferior turbinal, on one side only, with no involvement of the septum. The opposite side of the nose was normal.

The appearance is that of a granulating mass, mammillated and covered with more or less purulent secretion. On examination with a probe it bleeds fairly readily. The bleeding, however, is not so free as with a malignancy, nor is it as likely to persist. On pushing deeper bare bone is rarely felt. Its presence would suggest syphilis rather than tuberculosis, or possibly an intercurrent syphilis. In addition the granulations are pale with a very definite demarcation from the surrounding tissue and no surrounding area of inflammation.

Etiology. Most authors lay stress upon the probable infection from the finger-nail in removing crusts from the nasal septum. The possibility of air-borne infection should, of course, be kept in mind. When one considers that the nasal vestibule is the first part of the respiratory tract with which infected air comes in contact, infection in this location might be expected more frequently. Factors in its prevention are probably the slight bactericidal action of the nasal secretion, together with the filtering action of the vibrissæ and the flow of the secretion outward. Infection might also occur by extension from the lower part of the respiratory tract, as well as by the blood and lymph channels.

Pathology. Tubercle bacilli are practically never found in the secretion and are often not demonstrable in the tissues. If found at all they are always rare and only discovered after prolonged search. Schultz in describing my first two cases speaks of "the number of tubercle bacilli as being surprisingly small. It required prolonged search through a large number of sections to find an occasional isolated, acid- and alcohol-fast bacillus. From the nature of the lesion and the numerical relationship of the bacilli one gains the impression that the bacilli are not only not numerous but also not very virulent." Of the histologic picture Schultz says: "Of the various elements which may be present in the tuberculous process—tubercle formation with giant cells, caseation, lymphoid infiltration and proliferation of fixed tissues—infiltration with lymphocytes predominates and characterizes the lesion; whereas caseation is less marked in both cases than one usually finds in such an amount of tuberculous granulation tissue."

Zarniko's description is so concise that I give it verbatim: "The growth consists histologically of a diffuse heaping up of round

cells in which single typical giant-cell tubercles are scattered. At times the tuberculous structure is not so evident. Then the existing giant cells of Langhans lie free in the granulation tissue. Tubercle bacilli are so rare that they frequently are not to be found even after prolonged search. The tendency to caseation is slight. The covering consists usually of stratified pavement epithelium which here and there sends processes into the depths of the tissue."

Differential Diagnosis. Nasal tuberculosis is most likely to be confused with syphilis, though Onodi performed a radical operation on a case supposedly malignant which he found subsequently to be tuberculous. Zarniko calls attention to the following differences:

1. Tuberculosis involves primarily the cartilage—syphilis, the bone.
2. Fetor is rare in tuberculosis—common in syphilis.
3. In tuberculosis there is no inflammation of the surrounding parts—marked inflammation of the surrounding parts in syphilis.
4. In tuberculosis headache and involvement of the trigeminus are rare—common in syphilis.
5. Tuberculosis is a slow process—syphilis is a rapid one.

In addition may be mentioned the Wassermann reaction, the administration of potassium iodide and the injection of tuberculin, as well as the histologic examination. The general examination will often prove of value as demonstrating evidences of tuberculosis or syphilis in other parts of the body. Zarniko calls attention to the fact, however, that we may find syphilis in a tuberculous subject, or *vice versa*.

Treatment. This is entirely surgical and consists in removal of the granulating mass with snare, punch forceps or the sharp curette. When located on the septum Körner advises the resection of the involved area by a wide incision through the septum, leaving, of course, a large septal perforation. Subsequently the areas are treated with lactic acid, on account of its selective action, or the use of superheated air, as devised by Holländer.

The prognosis is, as a rule, favorable, leading to early healing and cicatrization, though some writers speak of frequent recurrences. All of my own cases, with one exception, have yielded readily to this treatment with *no* recurrences. One case has been

followed for a period of ten years. One case of the ulcerative type was lost sight of, so that the ultimate outcome is uncertain. This was the only case in which pain was complained of. The growth has been removed with forceps and curette, well into the normal mucosa, the cartilage forming the base of the area. Healing has been prompt, with no septal perforation.

REPORT OF CASES

Case I. Jessie W., college junior, was first examined in October, 1914, on account of obstruction of the left nose. There was much thick secretion on both sides. High up on the cartilaginous septum on the right was a small punched-out ulcer, 2 mm. in diameter, surrounded by a small area of granulation tissue. On the left was found a somewhat larger and more superficial ulcer with a larger amount of granulation tissue. The Wassermann was negative. There was no reaction following the administration of potassium iodide. General examination showed an old healed tuberculous process at the right apex. Two weeks after the first examination the mass on the left was removed over an area 2 cm. in diameter and completely down to the cartilage. This tissue was submitted to Dr. David Marine, who pronounced it tuberculosis, tubercle bacilli being demonstrated. The lesion on the left was completely cicatrized eight weeks after operation. Eight months later there was slight recurrence on the left side and a fair-sized mass on the right. Both masses were removed. Four weeks later there was complete healing. This case was followed some ten months later. At that time there had been no recurrence.

Case II. J. M. S., physician, was first seen in February, 1921, complaining of nasal obstruction on the left. A submucous resection had been performed some years previously. Examination revealed some mucopurulent secretion, beneath which was a cauliflower, granulating mass 2 cm. in diameter. There was slight bleeding on probing, but no bone was felt. General health was excellent and no history of syphilis. Wassermann not taken. The mass was removed and submitted to Dr. Howard T. Karsner, professor of pathology in Western Reserve University. His report is as follows: "Specimen consists of several small masses, some of which are covered by a stratified squamous epithelium which in some places shows elongated papillæ, which, however, do not appear to be other than proliferation due to

inflammation. The tissue is made up of a connective-tissue network, in some places dense and hyaline and in other places loosely arranged. Scattered about are numerous tubercles with centrally disposed epithelioid cells surrounded by lymphocytes. In about half the instances typical Langhans giant cells are found. The density of arrangement of some of the connective tissue indicates that the process is chronic rather than acute. *Diagnosis:* Chronic miliary tuberculosis."

Case III. Mrs. A., aged thirty-eight years, was examined in February, 1921, on account of left-sided nasal obstruction. This was found to be due to a pale granulating mass situated along the anterior septum. Little or no shrinking with cocain and adrenalin and no bleeding. No bare bone felt. This mass was removed, but unfortunately was lost. One month later a granulating mass along the anterior part of the inferior turbinal, together with a necrotic mass posteriorly, was removed. This was submitted to Dr. H. Goldblatt, resident pathologist at Lakeside Hospital, who reported the following. "*Histological Description:* Sections of tissue from the inferior turbinal. The superficial epithelium is of the stratified columnar type. These epithelial cells are very markedly swollen and their cytoplasm is either clear or vacuolated. The epithelium varies in thickness and over a large portion of the tissue is deficient. In the subepithelial tissue there are several large and small areas of necrosis surrounded by giant cells of the foreign body and Langhans' type, by epithelioid cells and by lymphoid cells. Where there is no necrosis there is rather marked vascularity and marked diffuse infiltration by lymphoid cells, eosinophils, plasma cells and endothelial cells. In some areas there are present large collections of epithelioid cells surrounded by giant cells. Throughout the tissue there is some diffuse fibrosis. In the absence of a positive Wassermann and of other signs of lues this could undoubtedly be considered as a tuberculous process, but vascularization and fibrosis, however, make the diagnosis of tuberculosis in the absence of this information rather difficult. Special stains for tubercle bacilli will be made and an additional report sent. *Diagnosis:* Granuloma, probably tuberculous.

Every effort has been made to secure a Wassermann on this last patient. It is a matter of extreme regret that this has so far not been possible.

Discussion

Dr. Emil Mayer, New York City:

I am one of those who still feel that we should keep up with the term of lupus, because there is a great big difference between tuberculosis *per se* and the attenuated form of tuberculosis that we call lupus. In the cases of lupus of the upper air passages that I have previously reported, which I have watched patiently for eighteen to twenty years, attending to their usual duties, I feel that I was justified in adhering to the original diagnosis, and there is a difference.

In regard to these cases that Dr. Chamberlin spoke of as airborne infection the thought occurred to me: why not consider the finger-nail infection? These are cases in which the disease appears in the area that could easily be reached by the finger-nail on entering the nose. There is another form that cannot be classed among the ulcerative or tubercular. In these cases he spoke of either a destruction or a form of newgrowth. We have a lymph-exudative form. I have seen cases of that kind of tuberculosis of the nose in which the only symptom was that of repeated attacks of laryngeal spasm. Examination showed yellow exudate, which eventually showed miliary tuberculosis, and the patient went to pieces rapidly.

I might call attention to a diagnostic point of the utmost value in making the examination of the upper air passages. In one case I made an early diagnosis of tuberculosis in a young woman whose only evidence was a yellow exudate on the inferior and posterior portions of the uvula, which was fully verified.

Now the importance of making a differential diagnosis between lupus and tuberculosis to my mind is, in the first instance, the importance to the patient of the fact that you can tell him that he does not need a change of climate and will be just as well off at home as anywhere else; and, in the second, the importance to the patient of being relieved from any fear of the possibility of contagion, so far as his carrying the disease to anyone else is concerned.

Then the thought occurred to me, on hearing the remarks of Dr. Wood yesterday, in which he deplored operative procedure on any of these tubercular cases, Why not treat them with the galvanocautery? That can be as safely done in the nose, and the condition as thoroughly eradicated, as anywhere else, and with less danger from having an open wound where you might have a tubercular patient and have a recurrence of his condition.

I should like very much to have Dr. Chamberlin ultimately report what has happened to the second case. That patient, as I understood, had miliary tuberculosis, and I regard this as a most dangerous sort of condition to the patient, who may succumb in a very short time.

Dr. Lee Wallace Dean, Iowa City, Iowa:

During the last two years we have been investigating the cases of chronic suppuration of the paranasal sinuses in patients with pulmonary tuberculosis. At the same time those patients with chronic otorrhea were investigated. Many of the diseased mastoids were found to be tuberculous. We found no case of tuberculosis of the paranasal sinuses unless the paranasal sinus disease was secondary to a neighboring bone tuberculosis.

In one case of maxillary sinus disease, fluid aspirated from the sinus contained acid-fast bacilli and the injection of a guinea-pig was positive for tuberculosis. The sinus was opened, the mucosa lining of the sinus and a piece of bone from the wall were removed and examined and were found not to be tuberculous. The bacillus tuberculosis was present merely as an accidental contamination.

Dr. B. Alexander Randall, Philadelphia:

I want to mention the case of a colleague which was diagnosed by Dr. Harrison Allen as a case of tuberculosis, which more or less completely involved the nasal chambers themselves. Many of his teeth were loosened. These were all removed, with curettement of the alveolar processes and nearly complete evisceration of the nasal mucosa carried out. This was the first case of this condition that was brought to my attention and occurred thirty or more years ago. The patient survived for twenty years or more. Psychic troubles, which led to his being for a while in the Norristown Insane Asylum, were present. but were probably the result of drug habituation. The case has a bearing on the mortality of the condition and belongs to this discussion.

Dr. Lee M. Hurd, New York City:

I wish to report some cases of mistaken diagnosis. One of these was a case of so-called lupus—lupus of the lip and vestibule. Sections were found by one pathologist to be tubercular. Dr. Jonathan Wright doubted this and said that granulomata from syphilis and from tuberculosis could not be told apart under the microscope. The case cleared up under mixed treatment. Other cases that were diagnosed as tubercular all cleared up under antisyphilitic treatment. They were all in the anterior part of the nose.

Dr. Chamberlin (closing):

In regard to Dr. Mayer's insistence on the term lupus, I personally cannot see any great justification for that term. Of course the dermatologist applies it to a definite lesion of the face. In all these cases, twelve to fifteen in all, there was absolutely no lesion of the face, although I think that the dermatologists agree that a tuberculosis of the face frequently has its origin in the nose. Dr. Mayer did not hear my remark about the finger-nail being the most probable cause of infection, airborne infection being probably the most insisted on.

The type of cases he mentioned, I am glad to know of. I do not know anything of that type of case. His suggestion in regard to treatment is apropos. I should think that it would be as efficacious as in tuberculosis of the larynx. I think one should be careful, in the use of the galvanocautery, not to carry the cautery so deep that the cartilage becomes involved and perforation ensues.

In regard to my second case, of which Dr. Mayer spoke, that was the case of a physician, one whom I have known for many years. There had been no examination of the chest. He was a man in apparent good health, and consulted me only on account of nasal obstruction. He was as surprised as I was to find that it was a tuberculous process.

In many of these cases I made a probable diagnosis of tuberculosis, which was ultimately confirmed by the pathologist.

In regard to Dr. Dean's reference to tuberculosis in sinus cases, I must say that I have not found it in such cases at all. I should think that we might find it in suppuration of the sinuses simply from contamination.

Dr. Randall did not make clear whether the case he mentioned was a so-called primary case or was secondary to a primary condition elsewhere. Of course, primary tuberculosis is a relative term, because we cannot demonstrate the fact that any patient has not had tuberculosis elsewhere. Apparently all my patients were in good health.

Dr. Hurd's remark about lupus has been answered in my answer to Dr. Mayer. I think that the term is confusing. It implies that we have an advancing process in conjunction with the healing process, characterized by cicatrization. I think that the term lupus should be dropped.

SOME OBSERVATIONS ON LOCALIZED PULMONARY SUPPURATION TREATED BY ENDOBRONCHIAL IRRIGATION

CHARLES J. IMPERATORI, M.D.

Lung abscesses may be divided into three classes: those that are caused by aspiration, by embolism, and another type, possibly a tubercular cavitation, with a secreting lining of infecting organisms.

The aspiration type of cases has been known to occur in three days; this, however, is exceptional; the abscess usually developing from thirteen to fifteen days after the inhalation of secretions or foreign bodies.

The embolic type usually occurs within three to five days following some operative procedure. It would seem there should be more cases of lung abscesses, especially of the embolic type, following tonsillectomy, as has been suggested in a discussion by Coakley before the New York Academy of Medicine. The movement of the pharyngeal muscles, the respiratory efforts and the open veins would seem to tend toward embolism; however, from clinical observation, these cases are very rare.

Regarding the third type I am not prepared to enter into a discussion of their etiology at present, but it is hoped that at some early future date I can present before the Association further studies.

The following observations have been conducted on patients in Bellevue Hospital on the service of Dr. Coakley, and while not a great number, still some conclusions may be drawn from them:

There are seven cases, two being alive and still under treatment. Of the five deaths one died from a carcinoma of the bronchus and was reported at the February meeting of the Eastern Section of the American Laryngological, Rhinological and Otological Society. One was operated elsewhere, that is, a pneumectomy was done, but the patient succumbed on the table, and the other three cases died from an intercurrent pneumonia.

The family history in all these cases, in so far as it concerns our observations, is negative.

The past history averaged about four to six months' duration of cough, profuse expectoration and accompanied by more or less pain in the chest.

In two of the cases there was considerable loss of weight.

None of these cases followed tonsil operation; all of them came on insidiously.

The age of the patients ranged from twenty-six to fifty-two years, and there were six males and one female.

Sinuses and tonsils were negative.

All of these cases had varying degrees of pyorrhea alveolaris.

Temperature in most of the cases never ranged over 100° to 101°, excepting in one case that was of the septic type.

They were all ambulant cases excepting toward the end.

There was no special amount of dyspnea and never any stridor.

Six of these cases showed marked clubbing of the fingers and one of the toes.

Blood examinations, that is, differential leukocyte and total leukocyte count, varied so that they were inconclusive.

Bacteriology showed so many different varied bacteria that no definite conclusions can be drawn from this observation.

The diagnosis of all these cases was confirmed by radiographs.

The average size of these lung abscesses was from three to four inches in diameter and of an irregular outline.

Location in four cases was in the right middle lobe, two in the lower lobe and one in the right lower lobe.

Repeated sputum analyses were all negative in these cases for tubercle bacilli, and yet in the four cases autopsied four showed marked evidences of tubercle.

The amount of sputum was remarkably controlled by bronchial irrigations. General well-being and the amount of appetite usually much improved. Less cough. Sleeping much better. Fewer pains in the chest, although, as a rule, following the bronchial irrigations there would be some chest pains. All of these cases appeared to do well for a time.

The longest time that any one case was under treatment was nine months.

Patients having from three to four cupfuls of sputum a day, that is, material raised from the lung and saliva amounting to a pint, could by these bronchial irrigations be reduced to less than a cupful. The number of irrigations given was from one to thirty, with an average twenty. Starting in with one a week, and as the patients became accustomed to the passing of the bronchoscope, which, of course, was done under local anesthesia, they were irrigated every five days.

The apparatus used was usually a 7 mm. Jackson bronchoscope passed through a Mosher laryngoscope and two ordinary bronchial aspirating tubes, one for the injection of the saline and the other for its withdrawal. In the first few cases the Yankauer apparatus, suction and injecting tube was used, but it was too delicate an instrument for hard usage. However, the method is entirely that of Yankauer.

From eight to ten ounces of normal saline solution would be injected into the bronchiole from which the maximum amount of pus was coming and that had been previously determined at the original bronchoscopy. This would be immediately aspirated through the aspirating tube; some would be ejected through the bronchoscope. When the washings came through clear a bismuth-oil mixture was injected; this consisted of 30 grains to the ounce of bismuth subnitrate in 1 ounce of olive oil; in the latter cases bismuth subcarbonate was used. This was properly sterilized before use. As a rule, most of this bismuth mixture would be coughed up before the patient left the table. Bismuth sulphide was noted in the first washings, at subsequent irrigations, in most of the cases that were irrigated every five days. In some few cases the bismuth remained in the neighborhood of the abscess or in the bronchi. The odor of the sputum was considerably lessened and the extremely fetid characteristic was not so marked. On stopping the irrigations and injections the odor returned and the amount would be markedly increased.

Conclusions. Of the five cases that died four were autopsied and proved, beyond doubt, to be tuberculous; one was a carcinoma with a tuberculosis. All of these cases were repeatedly examined, careful sputum analyses made, fluoroscoped, radiographed and it was decided that they were probably not tuberculous and referred

from either the medical, surgical or tuberculous wards as cases suitable for treatment. The remaining two cases, clinically, have the same characteristics that the other five had.

Simple bronchial irrigations, in the writer's opinion, in the control and treatment of lung abscesses of this type are of little use except as noted above. It is very possible, with the use of the spiral irrigating tubes of Lynah, better results may be obtained, and this method will be pursued in subsequent cases.

Various medicaments were used in some of the early treatments of these cases, such as iodoform emulsion, iodin in olive oil, tincture of iodin, weak Dakin solution—one to ten—and boric acid solution, all with negative results. Warm saline solution and the injection of olive oil, impregnated with the 5 per cent bismuth, seemed to be as efficacious as anything.

Idiopathic lung abscess, and by that is meant the type of abscess other than that directly traceable to aspiration or trauma of some foreign substance or the embolic abscess following some surgical procedure, is possibly a tuberculous cavitation with a lining area of pyogenic organisms. This cannot be given as a definite conclusion and is merely suggestive from these personal observations and must be proved by a larger series of cases.

Discussion

Dr. Emil Mayer, New York City:

I do not believe that this brief paper should pass without some mention, because those who have never attempted irrigation of any of these distressingly fetid cases have no idea of the almost heroism, I might say, that it requires for a man to take up this kind of work. A patient with a purulent condition in his bronchus is a most unhappy individual, and anything that can be done to relieve these patients is of such value that it should be received with every bit of recognition possible. As Dr. Imperatori says, not enough of this work has been done to enable one to state definitely what particular remedy is going to be of the greatest advantage. There is one thing, however, that I wish to call attention to, and have called attention to, in regard to this same subject, and that is the need of a certain amount of care in not

doing irrigations too frequently. These patients receive, as a rule, a hypodermic injection of morphin and require a fairly strong solution of cocain to render the bronchus as free from cough and irritation as possible. It must be borne in mind that while we have a dreadful disease, yet we have no right to inflict on these poor individuals, in addition to their other suffering, either the morphin or the cocain habit. This, to my mind, is an important note of warning that should be heeded.

Dr. George L. Richards, Fall River, Mass.:

I should like to ask what objection there would be to making a direct opening into the lung, resecting one or two ribs and getting direct outward drainage. I had a case in which I was doubtful whether it was tuberculous or not. The general surgeon, under general anesthesia, resected the ribs and drained the abscess outwardly, and although the girl had suffered for two months, she slowly and continuously got well and is at work at her occupation. Is there more risk from the surgical operation of making an opening directly into the lung? As Dr. Mayer says, it is more or less disagreeable to the patient to make these irrigations. The technic must be of considerable difficulty on the part of the operator.

Dr. Henry L. Swain, New Haven, Conn.:

Dr. Richards's suggestion of an opening on the outside presupposes that you can readily discover where the abscess is and can get at it that way. I have run across a couple of cases in which that was not easy even after the injection of bismuth. It cannot always be done with any great degree of safety or accuracy.

I should like to ask Dr. Imperatori how much trouble he has in getting his patients accustomed to the dosage. He spoke of it as though it perhaps were not so dreadfully difficult. Does he always operate on the recumbent patient? I have sometimes thought that if I could get the patient to sit up so that the stuff would stay in better than when lying down it would be a good thing.

Dr. Henry L. Lynah, New York City:

Dr. Imperatori has classified his lung abscesses under the headings of aspiratory and embolic. I believe that most of them are aspiration cases, because most men agree that embolic cases die rather early, and among those that I have treated under bronchoscope observation

the great majority are still alive. In the washing of the abscess I do exactly as Dr. Imperatori does—wash in and suck out. I should like to know how much solution is left in the tree afterward. It is, I think, always coughed out, as you cannot keep aqueous solutions in the lung. I never recover any by suction afterward. Having done this by suction only, and noticed that the earlier cases suffered with edematous stenosis and the later ones with cicatricial stenosis, I found that by using curved spirals that will go into the branches I could cure the cases as well by that simple method. As to making injections of bismuth, that was not done with the intention of curing the cases, but I found that the *x*-ray action or the bismuth in the tissue is curative in certain cases. We have some bismuth in the lung for ten months afterward. With the disappearance of the bismuth from the lung the abscess has cleared up. In the cases that follow tonsillectomy with early bronchoscopy, even those in a critical condition, we have had some startling recoveries with injection of bismuth and dilating of strictures.

Dr. William B. Chamberlin, Cleveland, Ohio:

Dr. Lynah's remarks illustrate a case of mine in which removing the granulation tissue plugging one branch proved beneficial. This boy, aged eighteen years, had given a history of purulent expectoration since he was six years old, probably produced by a foreign body. We could find no evidence of it by *x*-ray examination. If it was a foreign body it gave no shadow on the plate. Subsequent to bronchoscopy and aspiration the purulent discharge decreased decidedly, and the odor almost entirely disappeared. There was marked improvement after each treatment, no bismuth being used. I had a letter from him just before leaving for Atlantic City. Whereas his paroxysms had been twelve to fifteen a day, they had decreased in number and in the amount of the discharge. He had gained ten pounds in weight and the odor had entirely disappeared. When I first saw him there was a foul odor to the breath. This had disappeared, as well. I sympathize with Dr. Lynah as to the difficulties in these cases.

Dr. R. Bishop Canfield, Ann Arbor, Mich.:

I should like to mention a case similar to Dr. Imperatori's last case. It occurred in a child, aged eleven years, with a chronic abscess of several years' standing, with six ounces of expectoration at intervals of five or six days. The patient made a satisfactory recovery after

aspiration and the use of compound tincture of benzoin. It seemed to have a remarkable effect on the walls of the abscess. This was confirmed by the *x*-ray, and the patient made a perfect recovery.

Dr. Harmon Smith, New York City:

I should like to ask whether in tuberculosis there is danger of hemorrhage, and whether the use of iodin and olive oil would not enable the patient to retain it?

Dr. Imperatori (closing):

The point is to find out whether I was correct in my assertion that these lung abscesses may be caused by other means than by aspiration or embolism. All of these cases were seen in Bellevue Hospital and had been transferred to the otolaryngeal service from the surgical, medical and tubercular services. They were assumed not is be tubercular, although from the radiographic plates several had been diagnosed as such, and then the diagnosis was changed. That is what makes it a little confusing, and I thought that it might be of interest to present these findings before the Society. None of these cases followed tonsillectomy. There have been no embolic cases. In the four autopsies there were found distinct tubercles, from $\frac{1}{2}$ to 1 cm. in diameter and within 1 cm. or so from the cavity.

Answering Dr. Mayer: The patient never gets more than $\frac{1}{4}$ grain morphin and the amount of cocain is never more than 1 dram to $1\frac{1}{2}$ drams of a 2 per cent solution. The method of cocainization is to make an application to the tongue and the base of the tongue, then to the vallecula and then to the cushion of the epiglottis. Using an applicator syringe, touch the glottis and at the same time inject a few drops of the cocain. Using an atomizer, spray the trachea, and as the carina is passed make an application at this point. After the bronchoscope has passed the carina no further cocainization is necessary. Regarding the odor, it is terrible, but one can become accustomed to terrible things.

Answering Dr. Richards: I know of several cases in which outside drainage was done and olive oil and iodin were used by the general surgeon.

Answering Dr. Swain: I always bronchoscope the patient in the reclining position and usually use a 7 mm. tube. I expect to have a 5 mm. tube made in order to get into the smaller bronchi.

Answering Dr. Lynah: I had hoped that he would answer some of

the questions asked. I am of the opinion that none or very little of any solution will stay in the bronchi or the abscess cavity. Following Yankauer's technic, I used a saline solution—injecting it and at the same time aspirating it. Knowing that Dr. Lynah was injecting these lung abscesses with bismuth and then radiographing them, and hearing that he was curing them, I decided to try this method, and with the above-mentioned results. At first I used bismuth subnitrate, but later I changed to bismuth subcarbonate.

Answering Dr. Harmon Smith: In regard to tuberculous cases and the danger of hemorrhage, I do not think that these cases should be bronchoscoped.

GROUP HEAD SURGERY

BURT R. SHURLY, M.D.

THE scientific progress of special surgery in the last two decades has been so rapid and expansive that, together with the evolution and revolution of social medicine and the World War, it has been imperative that the individual adjust or succumb.

Medicine as a practice is coming by leaps and bounds within the classification of group, industrial or state. Those of us who were satisfied with methods of prebellum days must decide as to the classification we will select. We must rearrange our work and adjust or more firmly establish our independence.

The group system of study, development and practice is as old as Hippocrates himself. Every proprietary teaching unit of the older days was in point of fact group medicine. The small hospital staff or clinic has exemplified for years the idea of coöperative combined effort for scientific and general professional advancement. The more perfect and enthusiastic its organization the higher the ideals and accomplishments.

The flowers of our profession, the general practitioners, are withering and fading, and medical education with higher and higher standards is creating demands for luxury, diminished labor, less responsibility, more money and amusement. To meet these demands group medicine and specialism with greater compensation have been in great favor. The public has been educated accordingly and they look naturally to the medical center of the large city or the university for diagnosis and guidance.

There are many dangers in this rapidly changing system that will soon surround the medical profession with grave and difficult problems. Competition is keen. Unjust and hypercriticism are fashionable, and the unkind, restless, nervous spirit of war is among the people.

Group head surgery and group medicine with hospital care are

demands of the laity for service. Concentration of professional effort for efficient scientific diagnosis is welcomed. The demand of army training and medical education for examination, hospitalization and operation when necessary have spread throughout our nation and group head surgery satisfies this demand for special attention.

This system will win or fail if guiding hands steer it safely from the shoals of commercialism and fee-splitting. If efficiency and humanitarianism are not sacrificed by greed, disloyalty, lack of harmony and coöperation the group system is sure to win.

The advantages to the patient are self-evident. He realizes fully the necessity of laboratory, *x*-ray, dental examinations and hospital observation at a fair fee.

The group system adds the danger of machine diagnosis and repair shop methods. It is said that one of our automobile hospitals is so highly specialized that the operating room resembles the assembling plant to such an extent that one man prepares the field, a second makes the incision, a third operates, a fourth sews up the wounds and a fifth puts on the dressing, while the sixth, the anesthetist, moves the patient to his room and a seventh brings in another patient. Humanitarianism is so far removed that the eighth, who takes the history, is the only one who can recognize the patient on the street some weeks later if the patient is lucky enough to get there.

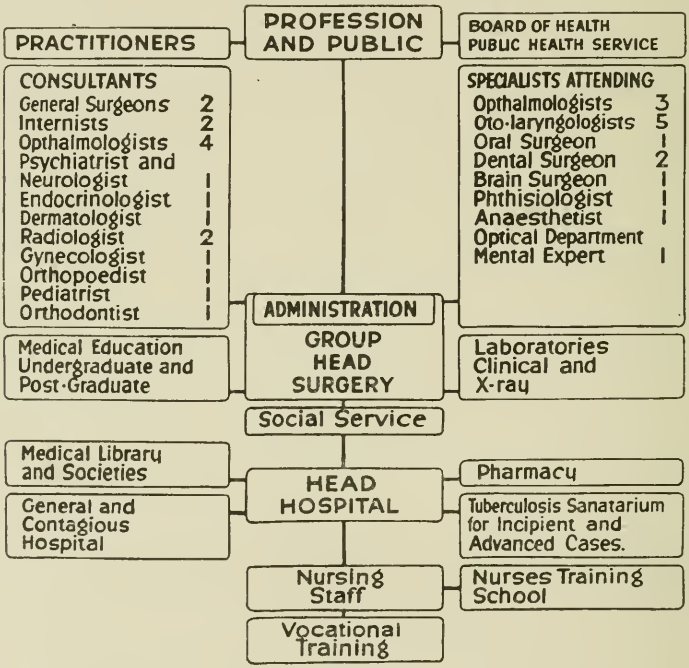
Group head surgery must be affiliated with or control a head hospital and teaching opportunities to be scientifically progressive and efficient.

A marvelous change has come over the armamentarium of the laryngologist of two or three decades ago. A laryngoscope, a galvanocautery, a Matthews tonsillotome, a Jarvis snare and a few spray bottles would make a busy specialist. He is now a dependent. Scientific progress and the public demand have required the nurse, the assistant specialist, the hospital and the laboratory. It is rare indeed in our large cities that tonsillectomy, mastoidectomy or many minor operations are performed without operating-room facilities.

To the American Laryngological Association belongs the honor of developing, classifying and standardizing the head specialties.

Your committee for war work, consisting of Drs. Richardson, Mosher, Bryan, the writer and others, deserves the credit of establishing for the first time in the history of our country specialists in the army of the United States.

By their efficient and patriotic endeavor, ear, nose, and throat men were permitted to join the army as such. Under their guidance, and by the order of Surgeon-General Gorgas, group head



surgery became possible. The work accomplished, the sacrifices made, the life-saving value of the special skill applied and the influence of this system of special coöperation in the final success of the medical department in the World War will be spread upon the records. Proper credit will be placed where it belongs.

At the beginning of the war the American Medical Department had no organized corps of specialists in any field. In our own specialty, for example, regular medical officers were assigned to

duty as eye, ear, nose and throat specialists, who were usually without interest or training in the work. Your committee changed this immediately. Group head surgical units were organized and successfully performed enormous labor in this country and abroad. The original estimate of 200 beds in a 1000-bed hospital devoted to army hospital work was approximately correct.

In Base Hospital 36, A.E.F., originally 1000 and finally 3000 beds, which I had the privilege of directing, 15,824 sick and wounded were admitted. Of this number 27.3 per cent were operated or observed by the group head unit.

It is the tremendous success of group organization in the war that has created its demand today. In my opinion it has come to stay because it is logically correct as the method to reach and serve the profession and the public at a minimum of expense and energy.

We must realize that the modern patient is impatient, hypercritical, unstable and changeable. The doctor of today is changed for one of tomorrow. The law of obligation and the mere matter of appointments at the office or for operation are more often broken, bills are more frequently returned with the postmaster's notation, "Left no address," than in former time. Appreciation of professional service has diminished and the wise counsel of the experienced practitioner is turned aside for the fad of the osteopath. The fashionable clique changes its doctor for one more fashionable. The fault is within ourselves.

To meet this new and strange psychology we must establish a remedy that will hold a stampeding, panicstricken, sick public until adjustment takes place. Standardization of medical colleges, hospitals and specialties is great and glorious work, but it is too slow for a remedy. This is the age of the aeroplane, the automobile, the transcontinental flyer, the ocean greyhound, the auto bandit and the movie. This is the mechanical and amusement stage of the world. More than 10,000,000 men have been moving to or from the great guns of war. This is the age of vibration and storm. The quick lunch, the short sleep, the short skirt and artificial hair are the rage. A gentle question may receive a burst of anger. A simple request to perform some simple duty may be met with the ultimatum to get someone else. The public and the

profession will not wait. The explanation is that the world is restless, irritable and less honorable.

Lastly, the remedy is found in group medicine and service. The physician, the surgeon or the specialist can be changed within the group domain to satisfy the whim, fad or fancy of the patient. The most renowned and learned professor of the knife is helpless to cure without his patient. The research scholar is useless without his human material. The specialist must have his ear, nose and throat to demonstrate his new operations. Our remedy is group head surgery.

Advantages of Group Practice. The advantages of group practice are better diagnosis and scientific work, coöperation, mutual interest, conservation of effort, quick service to the profession and the public; the use of team-work at all times of the day or night; the division of labor; specialization along lines particularly interesting to the individual; the pleasure of working among the sick where no one man thinks he owns the case; coöperative system in buying of instruments and general equipment; conservation of office space; the practical value of an office and hospital together that can be operated by the same staff for the mutual advantage of the patient and the practitioner.

If state and industrial medicine with health insurance are to absorb private practice it will be necessary to adopt a feudal group system to protect the practitioner and the public who demand private service, just as it was necessary to organize against the hordes of barbarians who swept over Europe from Turkey. It will be of advantage in case state medicine and state hospitals increase to combine with other groups for their personal protection and existence. The success of the group is in relation to the ordinary attributes of industry, intelligence, harmony and a spirit of coöperation, all of which characteristics ultimately receive their full reward.

Disadvantages of Group Practice. The personal equation is lost between the physician and the patient; the machine and dispensary methods prevail unless carefully guarded. It is difficult to obtain a group of men who are temperamentally fitted to associate in harmonious endeavor. It is difficult to find practitioners who will always operate under the Golden Rule; but as this is

difficult in almost any walk of life it may not be considered as a disadvantage. It is difficult to obtain men who do not overestimate their personal value and who entertain sufficient broad and humanitarian views to handle patients properly. It is difficult to obtain a group of men equally fond of work.

Conclusions. 1. The practice of a specialty is no longer the work of one man.

2. It is necessary for increasing efficiency to coöperate and affiliate with a staff and a hospital.

3. If an army system of group practice in time of war is theoretically and practically ideal, why not apply the same system to private life?

RADIUM EMANATION: ITS ADVANTAGES OVER RADIUM FOR USE IN THE UPPER AIR PASSAGES A NEW WAY OF APPLYING IT

OTTO T. FREER, M.D.

The limited distance to which the radium rays are therapeutically effective is in part due to their divergence in all directions in the manner of light rays, so that only moderately far from their source they become too far apart to materially influence morbid states. The greater the amount of radium or its emanation placed at the source, however, the greater will be the distance to which rays sufficiently close together to give the required therapeutic effect will be projected, just as a strong light will illuminate a larger area than a weak one. It is therefore important in treating morbid states with radium that the source of the rays be as large as possible, and in this respect radium emanation presents great advantages over radium proper, for a concentration of hundreds of millicuries of emanation may be had where the greater scarcity and value of radium usually restricts its local employment to a few milligrams. Even when quantities large enough are to be had the bulk of so much of a salt of radium combined with its also necessarily bulky container would take up too much room in the nose and larynx, proving mechanically obstructive and unendurably irritating. For these reasons, since presenting a paper in this Association in 1918 on needling with actual radium, I have ceased to use the salts of radium directly and have employed emanation exclusively instead in a manner to be described. The emanation not obtainable in Chicago until November, 1919, I can now get in Chicago in desired amount from the laboratory of Dr. Frank Edward Simpson's radium institute.

The source of the radium rays employed must be so great that it will be sure to effectively permeate not alone the obviously diseased area, but also an apparently healthy wide zone about

it, and it must also be closely and exactly applied to the center of the disease, so that the rays will be equally diffused through the entire territory to be treated. While such accurate placing is easily obtained on the body surface it is unobtainable, except with special appliances, in the upper air passages, and it has been my effort in the past three years to create such appliances and a way of using them. It is true that needling places the source of the rays accurately, and emanation-filled needles give as large a source of the rays as can be wished; drawbacks, however, have shown themselves in the use of the needles that have led me to abandon their use, especially as surface applications of emanation with the appliances to be described have proved more effective than needling. The chief objection to needling is the impossibility of sufficient screening to prevent sloughing about the needle punctures in some individuals. These sloughs create great pain, are not cast off under many weeks and sometimes lead to severe hemorrhages when vessels become opened. Another objection to the needles is the refusal of some patients to permit needling at all, as it seems to them a formidable operation, so that promising patients refuse help.

Radium Applications to the Larynx and Laryngopharynx. These are the most difficult regions for exact and prolonged applications of radium emanation, and therefore patients with affections requiring raying of these parts were the ones oftenest referred to me; hence my experience has been greatest in the radium emanation treatment of carcinoma of the larynx, and it is to the making of appliances for this purpose that the most time and thought has been given by me.

The principle employed from the first in devising the laryngeal radium applicators, as I call them, has been that of using the forehead as the fixed base to which the applicators, reaching down into the laryngeal region, are fastened. Articles concerning a less perfected apparatus than the one described here, but embodying the principle, were published by me in the *Arch. f. Laryngol.*, volume xxxiii, 1920 Killian Festival Number, and also in the *Laryngoscope* for May, 1920.

The Laryngeal Radium Applicator. To make it, a length of eighteen inches of copper tubing, 3–16 inch outside measure,

is used and bent at the three angles shown in Fig. 3. The distal, laryngeal end of this tubular applicator serves for the attachment of two varieties of receptacles of radium emanation called "screens." These screens were devised by Dr. Frank Edward Simpson and Dr. R. E. Flesher, and are made by the Radium Chemical Company of Pittsburgh. They are designed to enclose little silver enameled tubules (Fig. 1, *A*) that contain minute glass tubes of horsehair thickness charged with emanation by a mercury vacuum pump. A single one of these almost microscopic glass tubes is capable of holding 400 mc., the equivalent of 400 mg. of radium, when fully charged. The silver enameled tubules that hold the glass tubes are 5–8 inch long and 3–32 inch in diameter, and are enameled in different colors to indicate the different strengths of emanation they contain. The screens as well as these enameled tubules screen off the alpha and softer beta rays from the tissues. The screens of Dr. Simpson and Dr. Flesher are of two types: One, intended to hold but one enameled emanation tubule, is of capsular form (Fig. 1 *B*). It has a wall of 1 mm. brass and one half of the capsule screws into the other, so that it can be opened to receive the enameled tubule. Each capsular screen has an eyelet bored through a solid metal projection at one of its ends. The other type of screen is of silver and the shape of a suitcase, opening at one end (Fig. 1, *C*). These case-screens are 7–10 of a millimeter thick and vary in breadth according to the number of enameled tubules they are designed to hold, their capacity varying from two to six tubules. Each case-screen has a set-in cover that fits one-eighth of an inch into its top without projecting over the edge. Bored in line through both case and cover about one-sixteenth of an inch below the top of the case is a hole one-sixteenth of an inch in diameter through which a wire may be threaded and twisted to fasten the cover securely to the case.

To attach the capsular form of screen to the copper tube of the applicator two grooves are cut longitudinally along the last two inches of the distal (laryngeal) end of the tube. A wire is then passed through the eyelet of the screen, bent up in a loop and soldered into the grooves, so fastening the container beyond any chance of accidental detachment (Fig. 1, *B*).

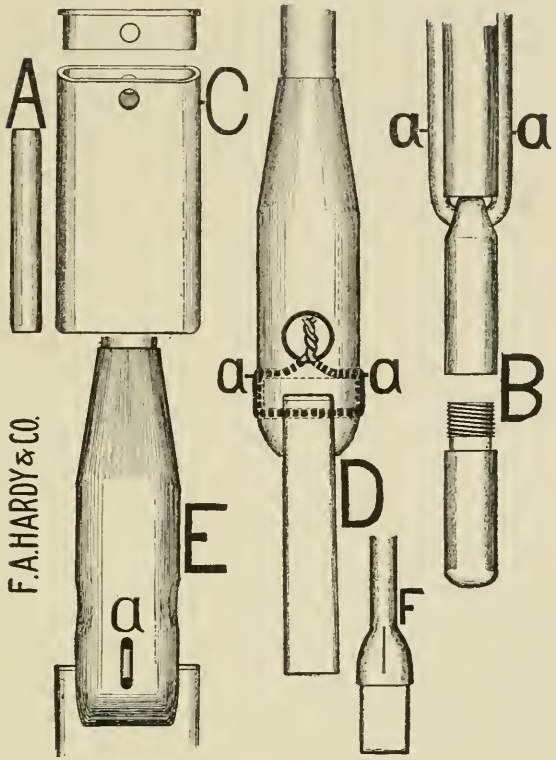


FIG. 1, *A*, Enameled silver tubule containing capillary glass emanation tube which may be charged up to 400 mc. Length of silver tubule, 5–8 inch. Diameter, 3–32 inch. *B*, Capsular screen fastened to tubular copper applicator at *a*—*a* by means of a copper wire soldered into grooves at the sides of the applicator tube and run through the eye of the screen. It holds only one silver emanation tubule. *C*, Silver case-screen with cover; wall, 7–10 mm. thick. These screens hold from two to six silver enameled emanation tubules, according to their breadth. *D*, Silver case-screen seen on edge, fastened into notch of holder by No. 24 tinned-iron wire, *a*—*a*, shown by heavy dotted line to indicate passage of wire through jaws of notch, walls of screen and its cover and thence into the interior of tubular holder through holes at *a*—*a*. The wire is shown twisted in the saliva hole of the holder in order to lock the screen safely to the holder. (Instead of using the jaws of a notch to hold the screen the author has lately used a socket *F* in which to place it, as this holds the screen more firmly. It however, unlike the notched holder is only usable for one size of screen. The wiring is the same.) *E*; Holder and case-screen seen on the flat to show the holes at *a* connected by a groove bored to pass the tinned-iron wire through the jaws of the notch, screen and its cover, and thence into the interior of the tubular part of the holder.

The case-screens are detachable and are fastened to the tube as follows: A holder for the case (Fig. 1, *D*) is made by cutting a notch as wide as the case into the end of an inch and a quarter of brass tubing, five-sixteenths of an inch outside diameter and with a bore of three-sixteenths of an inch, into which the copper tube of the applicator will exactly fit. The notch is five-sixteenths of an inch deep. Through the sides of the notch a hole is bored exactly in line with the holes mentioned as piercing the case and its cover when the case is pressed into the notch to its bottom (Fig. 1, *D*, *E*). About five-sixteenths of an inch above the holes through the sides of the notch and through the brass tubing above the bottom of the notch (Fig. 1, *D*, *E*) a corresponding second set of holes is bored. About one-eighth of an inch still higher up, and through the front and back of the brass tube, two larger holes are bored to act as saliva exhaust holes. After the holder so prepared from a piece of brass tubing has been smoothly shaped into a spindle form it is slipped on to and soldered to the distal five-eighths of an inch of the copper applicator tube, the jaws of the notch projecting downward to receive the case-screen. To attach the screen to the holder it is pressed into the notch to its bottom and a wire is run through the continuous hole so formed through the sides of the notch, the sides of the screen and through its cover. The ends of the wire are then bent upward and passed into the interior of the holder through the second set of holes mentioned and pulled out from one of the saliva holes, to be twisted until the screen is firmly held in the notch. The twisted wire is then cut off close to the saliva hole and pushed back into the interior of the holder so that it will not scratch. The case is now firmly held in the applicator and cannot become detached or opened.

The capsular screens occupy but little space and are used in narrow places, as in the nares or in a partially obstructed glottis. They are less used in the larynx than the case-screens, as the case-screens have the great advantage of holding several enameled emanation tubules, so permitting multiplication of the emantion dose used. As a measure for comparison I have assumed 50 mc. applied for one hour to be a standard dose of emanation and the giving of this dose weekly for eight hours a standard series, as experience has shown that after such a series the average laryngeal

carcinoma is absorbed and the parts acquire a normal appearance after the reaction has subsided. By means of the multiplying of the tubules made possible by the case-screens the eight hours of the standard series may be reduced to four, two or one hour according to the strength and number of the tubules used, a great advantage for irritable throats or for weak patients, as the time of the separate treatments may be thus lessened to thirty or fifteen minutes for such patients, while more robust ones may finish the series in two treatments of one hour each if 200 mc. be employed, 400 mc. hours being regarded, as stated, as the total standard dose for a series. In practice I have found that the great demand for the emanation has made it usually necessary to be satisfied with 100 mc. as the dose employed, making a series of four hours of emanation application the usual one for a laryngeal carcinoma. [Dr. Simpson has made twice as much enamation now available as when this was written.]

The thinness of the flat silver case-screens fits them peculiarly for use in the glottis, and a four-tubule screen will, without material obstruction to respiration, rest between the cords where there is no or only moderate laryngeal narrowing. When the glottis is too narrow for a four-tubule screen one containing three or two or a capsular screen containing only one tubule may be used. When there is marked chronic dyspnea a tracheotomy should precede the insertion of a screen into the larynx.

For holding the applicator in introducing it into the larynx a thumb-plate (Fig. 3) is soldered to it just above its second bend from below up. A rubber tube slipped over the upper end of the applicator tube goes to a vacuum bottle connected with an electric suction pump, which constantly exhausts the saliva from the throat through the applicator tube in order to prevent accumulating saliva from causing strangling and retching. My first applicators were solid and an independent rubber tube was pushed into the pharynx to pump out the saliva. The motions of this tube, however, caused retching. Since the applicator itself has been used as an exhaust tube this trouble has been avoided.

The Clamp. My present clamp (Fig. 2) is heavy and large and has long jaws, while the first one made was light and had very short jaws. It proved necessary to make the clamp so heavy and

viselike in order to hold the applicator firmly in its jaws, for the length of the applicator gives it a great leverage. Length of jaw was also needed in order that the vertical stem of the applicator, and therefore the screen in the larynx, could have a free forward and back range, and in order that the stem could be kept nearly or quite vertical, so that the screen could be moved up or down in the larynx and pharynx, as needed, from the laryngeal vestibule down into the subglottic space. The short jaws of my first clamp

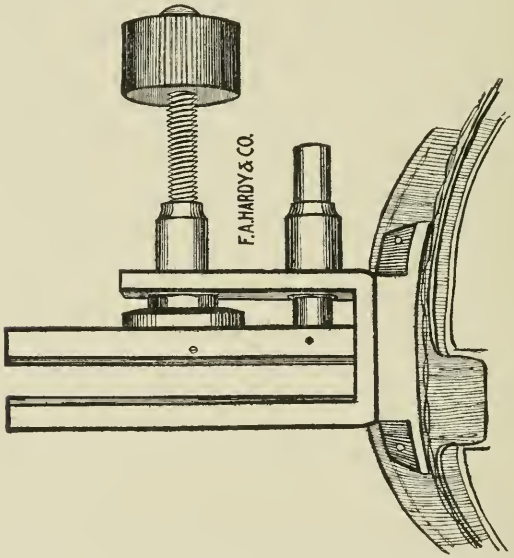


Fig. 2.—The clamp seen from above affixed to the forehead plate of the head strap and open to receive the tubular applicator stem.

projected so little that the applicator stem had to lie against the forehead in the line of its backward slant, so that the stem leaned backward at an angle of from 45 to 60 degrees. Motion toward the operator thus moved the stem out of the clamp and downward motion was stopped by the slant of the forehead, so that the tube had to be bent at a different angle to suit each patient and each part of the larynx. The present improved clamp can also be laterally placed by means of a cogwheel and geared track.

The clamp is held to the forehead by a broad leather strap headband, not buckled, but fastened firmly around the head by a screw clamp. A second strap, also fastened by a clamp, runs from the forehead to the occiput, and, resting upon the vertex, keeps the headband from sagging. To prevent discomfort from the weight of the clamp its metal forehead plate is lined with sponge rubber and is also cushioned by two flat moistened sponges. So padded the heavy clamp may be worn for more than an hour without discomfort.

The clamp permits instant fixation of the screen where desired, and with its aid it is even possible to adjust a small capsular screen against a vocal nodule. The angular bends of the applicator and its thumb-piece make it easier to introduce and hold in place in the larynx than an ordinary laryngeal swab.

The clamp's jaws are lined with rubber to keep the stem of the applicator from slipping

Manner of Application in the Larynx. The applicator is passed into the larynx with the aid of the laryngeal mirror, as in ordinary swabbing of the larynx. Only for the papillomas of childhood are suspension laryngoscopy and a straight applicator needed. The larynx is anesthetized with a 5 per cent spray of cocain, followed soon by swabbing the laryngeal interior with pure cocain flakes upon a moist swab. The clamp is then put on with the help of an assistant.

Anesthesine powder is then puffed into the pharynx and larynx to heighten the local insensibility. It intensifies the action of the cocain and quiets the retching caused at times by cocain in certain throats. The applicator is now introduced, the screen being placed exactly upon the spot in the glottis, upper larynx or fossa piriformis where it is wanted, while the assistant guides the vertical stem of the applicator into the open jaws of the clamp. He instantly closes upon it when the screen is in the right place, where it stays until the clamp is opened. The saliva pump is then started and the patient left to himself in the assistant's care. Should retching occur after a time, anesthesine powder or a little cocain spraying will usually stop it without removal of the applicator; but if it become violent the applicator is taken out, cocain sprayed into the throat and the applicator replaced. Retching

may often be prevented if the patient retain his napkin hold upon the tongue during the session. Some patients quietly endure the presence of the applicator for an hour or more; others need to have it taken out once or twice in an hourly session. It is usually tolerated longer in the fossa piriformis than in the glottis, and fortunately nearly all of the extrinsic carcinomata and morbid states of the upper larynx may be best rayed from the fossa piriformis. However, an uninterrupted tolerance of the screen in the glottis for an hour or longer is nothing unusual.

Reaction in Different Individuals. There is variation in the amount of reaction following properly screened emanation treatments. Most patients have none or but a slight reaction, exceptional ones a widespread and somewhat intense one. Ordinarily the first of a series of four 100 mc. hour treatments at weekly intervals is followed in form a week to ten days by a slight reaction, showing itself by redness and superficial desquamation, with small epithelial erosions. This reaction is kept up by the successive treatments until from two to four weeks after the last treatment. It is remarkable that there is usually little or no swelling even with a rather intense reaction, and only in the severer reactions met with is there marked edema of the aryepiglottic folds. In one patient the only burn occurred, a shallow slough of the mucosa upon the anterior surface of the epiglottis, which healed in a week. This burn occurred during a pronounced reaction following a second series of treatments for a carcinoma of the larynx that had made great progress and where intense treatment was necessary in order to arrest the disease. Dr. Simpson and Flesher have also seen so-called secondary reaction, that is, reactions that occur sometimes several months after all treatment has been suspended and all influence of the raying has seemingly ceased. These spontaneous reactions may be quite severe.

Glandular Involvement in the Carcinoma Cases. Two of the patients treated with the emanation applicators for carcinoma came with large, deep-seated secondary carcinomas in the glands external to the pharyngo-epiglottic fold, along which the invasion had traveled, creating the well-known externally protruding tumors between the angle of the jaw and the sternomastoid muscle, inoperable in these patients as they lay at a great depth,

their partial immobility in one case and total fixation in the other indicating adhesion to the great vessels. These masses were rayed by Dr. F. E. Simpson externally in all-night treatments, up to 800 mc. being applied in the tubules used. In both these patients these tumors rapidly shrank in size to an irreducible limit of about one-quarter the original mass and the immobile one became movable again. The neck invasion in these two patients had, however, become too widespread and deep before they were seen for permanent improvement, so that new lymphatic tumors sprang up in the lower triangles of the neck and renewed growth in the old sites occurred.

Smaller carcinomatous glands, while hard to be made to vanish, at least may be rendered stationary and harmless for a long time, and a good many shrink to insignificance and disappear.

Occasionally it becomes doubtful whether a small remaining lump is not merely a fibrous remnant of a previously epithelial growth. One such gland, that had been thoroughly rayed without further shrinkage, I exposed and found changed to a smooth-wall cyst containing a clear fluid. Unfortunately no histological examination was made, but the wall appeared to be merely fibrous. The reduction of cancerous glands in the neck in the submaxillary and upper carotid regions is greatly aided by cross-fire raying from the fossa piriformis and the lateral pharyngeal wall combined with external raying. The great distance to which emanation raying is effective is shown in Fig. 3, representing a patient whose facial hair disappeared up to the line *a*—*a* on his cheek, although no emanation was placed higher than the lower border of the lower jaw.

Dr. F. E. Simpson's and my conclusions, taught by his great experience and what I have so far observed, are that medium-sized and smaller movable carcinomatous glands may often be made to disappear or become stationary and harmless by intense emanation raying. Where, however, the glandular tumors have become large, and especially where they have become more or less fixed, improvement is liable to be deceptive, though the treatment may succeed in rare cases. It is necessary to subject the lateral regions of the neck where glands liable to invasion are situated to vigorous raying, although no glands at all may be palpable. The original growth, once reduced by raying, in my experience so far shows little

tendency to recur; but the endangered lymphatic glands must be constantly watched and should be occasionally rayed even though nothing suspicious be felt.

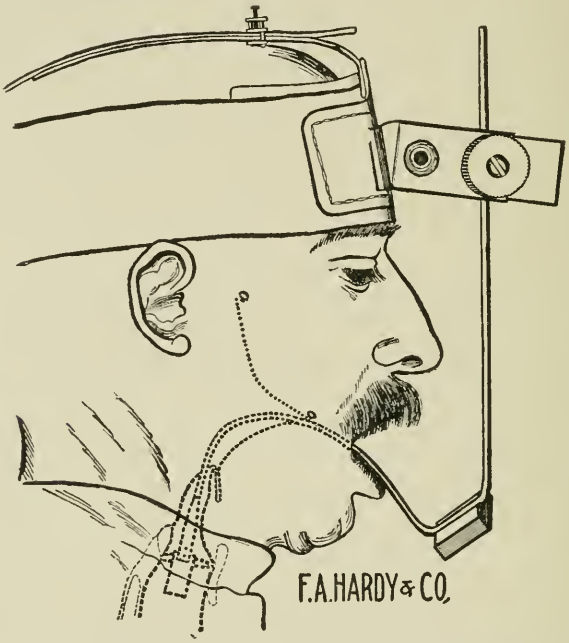


FIG. 3.—The applicator held in the jaws of the clamp with the screen in the glottis, as indicated by heavy dotted lines. *a—a*, fine dotted line to indicate the far-reaching influence of emanation in effective doses. Below this the hair of the beard ceased to grow, though no emanation was applied above the neck.

APPLICATIONS TO THE TONSIL AND FAUCIAL REGIONS. For this purpose an applicator is used that lacks the laryngeal bend.

NASAL APPLICATIONS. A headband is used upon whose forehead plate four small clamps are fastened. They consist merely of a piece of brass tubing opened widely enough on one side to admit lengthwise a stem of copper wire with a capsular screen soldered to its end. A set-screw penetrates the wall of the tube and fixes the stem at any point desired. The small clamps are affixed to the forehead plate upon their unopened sides. By proper bending of

the wire stem the screen may be made to fit into the desired place in the nasal cavity or pernasally in the nasopharynx, where it is held in place by closing the clamp. Such exactness is not obtainable when the screen is merely pushed into the naris upon a wire which is fastened by adhesive tape upon the face, as is often done.

Some Clinical Observations. A full description of the results of the emanation treatment here outlined is reserved for another article based upon longer experience. The purpose of this paper is the description of the method of applying emanation so that clinical findings are merely touched upon.

Six laryngeal carcinomas and four pharyngeal ones were treated with the applicators and emanation. Mention of previous cases treated with radium needling is omitted. Three of the laryngeal carcinomas were extrinsic, involving the arytenoids, the aryepiglottic folds and fossæ piriformes. Three were intrinsic, involving the right vocal cord in each instance. In the extrinsic cases the appearance of the larynx became normal in from four to eight weeks after the last treatment, inspection showing no trace of the growth. So far no patient has shown a local relapse, but in one the larynx has been invaded from without by rapidly growing glandular tumors. The intrinsic case patients permitted the use of a large three and four case-screen in the glottis as long as needed, for a full hour in several instances. In the most extensive of the intrinsic type, when first seen, the carcinomatous mass buried both the right vocal cord and the ventricular band, the right side of the larynx being immobile. There was no ulceration. Three weeks after the last of four intralaryngeal treatments of 100 mc. hours each the patient recovered his voice, which had been a hoarse whisper for half of a year. The right vocal cord regained some of its motion and became clearly outlined; all trace of the carcinoma disappeared. This condition has become stationary, cicatricial retraction binding the right cord partly down.

While the disappearance of a carcinoma takes the number of weeks mentioned, almost immediate improvement in the symptoms preceding the disturbance of the reaction has been repeatedly seen by me, as, for instance, the melting away of the verrucous excrescences of a papillary carcinoma of the pharynx lying just above the left arytenoid body inside of a week after the first raying.

Emanation treatment of a case of chronic hypertrophic laryngitis with a deep erosion of the interarytenoid space and deforming and voluminous hypertrophy of the vocal cords, with complete voicelessness for fifteen months, was remarkably successful, the voice returning with normal quality and the erosion healing after resisting all treatment by strong nitrate of silver applications and of tincture of iodin, by direct laryngoscopic treatment, voice rest, etc., until the patient, a vigorous young woman, became despondent. In this case the reaction was vigorous and simulated an immense aggravation of the condition, the erosion spreading and the cords becoming quite unrecognizable from swelling. After two weeks all of this receded and the larynx acquired a normal appearance, the erosion healing.

Since my change from radium to emanation there have been only two nasal cases needing raying. One was a rapidly growing round-cell sarcoma, which had destroyed the right lower turbinated bone, the right middle turbinated body and uncinate process and was entering the right lateral mass of ethmoid cells. As much of the growth as could be was removed and emanation applied by two capsular screens in the naris, one in the lower meatus and the other over the ethmoid wound. There was complete disappearance of all remants left by the operation and smooth healing of the defect in the regions involved. There has been no return of the growth since the operation and raying done about a year and a half ago. This is in accord, however, with the well-known semibenignancy of many nasal sarcomas.

The other case was one of nasal mucous polypi (chronic hyperplastic ethmoiditis), the polypi returning again and again, over many years, the last time after I had done a most thorough curettement of the ethmoid cells. After one prolonged emanation treatment the polypi shrank away and have remained away for nearly two years now.

Conclusions. The treatment of malignant laryngeal disease with radium rays requires a comparatively large dose of emanation, from 100 to 200 mc., applied at each sitting, in order to reduce the time of the raying to a minimum in the irritable laryngeal region and to flood the territory under treatment to its utmost pathological limits with rays sufficiently close together to destroy all

microscopic carcinomatous implants. Small radium doses cannot do this. They act effectively close to their application only and cannot reach well even into obvious carcinomatous areas in its vicinity, their use thus constituting a dangerous trifling with the spread of the disease.

Innocent affections of the larynx, such as hypertrophic chronic laryngitis, papillomata or fibromata, may be treated with lesser doses of the radium rays, at least without harm and with probable success, as peripheral regions need not be thought of. It is essential, however, that the radium or emanation be applied with perfect accuracy, such as that obtainable with the laryngeal radium applicators here described.

Owing to the bulk of the screens containing enough of a radium salt to be effective, radium itself cannot take the place of emanation in the treatment of malignant disease of the larynx, even if radium were commonly available in the large quantities that would be required. When radium emanation is not obtainable and only radium to be had, the best way to use the latter is in the form of the radium needles described by me in the *Transactions of the American Laryngological Association* of 1918. Deep sloughing, severe hemorrhages, prolonged wearing pain and the difficulty of having to reneedle returns before the sloughs have healed, are not inevitable accompaniments of needling, but may occur.

My experience with emanation and the clamp and applicator method here described warrants the statement that they in many cases will preserve the patient from laryngectomy and possibly lead to permanent recovery, and that the emanation treatment should always be tried before resorting to laryngotomy or laryngectomy. If unsuccessful it will at least retard the growth and tend to prevent relapses after operation, and there is a good chance that it will make all operating unnecessary in cases not far advanced and without distant gland involvement and metastases.

Discussion

Dr. James E. Logan, Kansas City, Mo.:

I very much enjoyed this paper, and I think that it is a wonderful step forward in the treatment of some of these cases.

I should like to question Dr. Freer in regard to the remark he made in reference to the treatment of sarcoma of the nasal cavity. I understood him to say that these cases will get well under treatment by emanations of radium. I should like to know whether that is sufficiently well established to warrant us in choosing it as the method to be followed?

Dr. Henry L. Swain, New Haven, Conn.:

I should like to know whether radium emanations should be used in laryngeal fibromata and whether these growths will yield to that treatment?

Dr. Henry L. Lynah, New York City:

I should like to know whether Dr. Freer has made pathological sections of any of these cases?

Dr. Norval H. Pierce, Chicago, Ill.:

I should say, without equivocation, that the last case that Dr. Freer reported was one of carcinoma. The only possible way to confirm the laryngeal diagnosis was by histological study. Here was a man within the danger zone as to age who had hoarseness increasing since January last. There was a distinct lagging of the cord, fusiform intramural growth, with more ulceration, I think, than Dr. Freer tells us. If this case recovers my enthusiasm for radium treatment will be greatly increased. I believe that it is a case of carcinoma. I have not seen the patient since the radium was applied.

Dr. Cornelius G. Coakley, New York City:

I think that it is unwise to report such a case as cured carcinoma, because I have clinically seen similar lesions which had all the appearances to me of being malignant, and in all these cases I feel that it is unwise to regard the condition as carcinoma. One should remove a section, and I have been surprised how often I have been mistaken in the clinical phase when compared with the pathologist's report.

Dr. Robert Clyde Lynch, New Orleans, La.:

I should like to ask whether there was any effect on the top of the cord in the case which Dr. Pierce spoke of and what Dr. Freer thinks is necessary in order to screen the normal half of the larynx while exposing the diseased side?

He commented on the fact that the needles, or rather the glass

capsules or seeds which the other men were using—produce sloughing, and that the content of 400 mc. of radium emanation is well screened, and for that reason does not produce the sloughing of the emanation seed buried directly into the tissue.

Dr. Henry L. Swain, New Haven, Conn.:

I should like to ask whether the flat container can be made to screen one side more than the other?

Dr. Freer (closing):

It seems best to answer the questions and objections concerning my article upon my experience with radium emanation collectively. The most important of the objections is the demand that the diagnosis of all throat carcinomas should be histologically confirmed by the examination of an excised portion of the growth in order to make it valid. This might be done without question were it harmless to the patient, even though, as it usually is, it were merely to pedantically prove the obvious; but the excision demanded is not certainly harmless, for in order to avoid error due to superficial and inadequate excisions that include only healthy tissue and do not reach an underlying carcinoma it is necessary to cut out a large piece of flesh. Such excisions have been often observed to greatly stimulate the growth of the cancer, and from the open surface carcinoma cells are liable to be carried far by the lymphatics. Then the effectiveness of radium emanation if properly placed in the throat has raised another point. Heretofore the discovery of a carcinoma in the larynx was only the prelude to dangerous and mutilating operations, and therefore, in spite of the risk mentioned, an incontestable diagnosis was a necessity. Now with a remedy at hand that can remove even an extensive growth without any destruction of the normal tissues, it is not justifiable to, for instance, cut out a part of a cord that may be restored to a normal state merely for a certified diagnosis that to the experienced is already obvious enough. This was the case in regard to the instance cited by me and confirmed by Dr. Norval Pierce. We had before us an epithelioma of a cord that to our experience was typical—to excise a piece would have spoiled the cord. As we expected, emanation restored the cord to complete normality with preservation of the voice.

Tuberculosis and syphilis may usually be easily eliminated from the diagnosis by the modern tests, and the superficial attachment of papilloma usually clearly points out its nature. Pachydermia of the larynx is also easily recognized by its typical form and location. Of

course, it takes experienced vision and a study of the subject to make positive distinctions, but these things should be acquired and are pursued far too little by the profession. There is one type of carcinoma that may, however, demand a histological test, and that is a small beginning papillary carcinoma that has not as yet penetrated deeply and where the use of intense raying may depend upon certainty whether the suspicious-looking little papilloma has a cancerous base or be innocent. It may be impossible to decide in such a case from the naked-eye aspect.

There is a type of carcinoma that begins deeply in the wall of the pharynx or under the ventricular band or subglottically, which for a long time causes merely a profound swelling of one side of the larynx with a smooth surface of swollen mucosa, no carcinoma tissue being seen. An excision here is impossible until the cancer is well developed and carcinoma nodules appear. Here typical fixation of the cord and the clinical aspect permit a diagnosis long before the microscope can make one.

That their observations have led them to regard radium as ineffective in the throat has often been said to me by other observers. It is here we are at variance; they speaking of the necessarily small and therefore inadequate doses of the radium salts, usually ill placed, while I, as shown in my paper, am employing the large doses obtainable by the use of radium emanation with the additional advantage of exact application. To move an object the power employed must pass a certain minimum in a given time or it will stay still. This is as true of the application of radium rays as well as of any other force. The number of millicuries used must be concentrated within a sufficiently short time to overcome the vital resistance of the cancer cells. Thus 100 mc. used for the space of one hour may be effective while 10 mc. used for ten hours, the same number spread over a longer time, will do nothing or may even stimulate the growth. To remove the growth the dose must be strong enough to, as it were, light up the whole neck with radium rays, which must penetrate the outposts of the growth in the manner of light rays. A candle burned for a hundred hours in a room will still leave it almost dark, while a light of 100 candle-power for one hour will light all of the dark corners, yet each gives the same total amount of candle-power.

The external application of emanation will not, as suggested, do as well as its use directly against the tumor in the throat. The malignant growth is a center from which it extends in all directions by continuity or the lymphatics, and the raying must therefore take place from this

center to reach all of it with sufficient intensity. Radium, as we are compelled to use it because of its scarcity, has but a moderate penetrating power in effective intensity. In this it differs from the *x*-ray. To apply it in a one-sided way, with healthy skin, muscles and cartilage to receive the brunt of the raying and to act as a screen, plus distance, would be to ray with sufficient strength but a small peripheral part of the growth. Thus, while the cords may be well cleared of an innocent papilloma from without with large doses of emanation, to attempt to eradicate a malignant tumor in the glottis in this way or to reach such remote parts as the arytenoids or posterior pharyngeal wall would be liable to result in disappointment. If, however, the patient's throat be utterly unmanageable and no screen can be retained in it, it is justifiable to use large emanation doses from without, as they will, in Dr. F. E. Simpson's and my experience, at least greatly retard the progress of the growth. A small malignant tumor upon the edge of a cord near the anterior commissure may even be made to disappear by strong external raying, as it may be rayed directly through the thyroid cartilage and is near the surface. To attack a deep one from without in this way would be to deprive the patient of advantages he should have, and from my observation would be futile.

REPORT OF CASES OF CANCER OF THE ESOPHAGUS TREATED BY RADIUM

(From the Clinic of the Huntington Memorial Hospital, Boston.)

D. CROSBY GREENE, JR., M.D.

The treatment of cancer of the esophagus has been one of the most difficult and thus far one of the most unsuccessful problems in surgery and in radiotherapy.

I wish to call your attention, first, to certain aspects of the situation which impress themselves upon one who sees many of these cases.

First as regards subjective symptoms. It is remarkable that cancer in the esophagus is in the majority of cases well advanced before the patients begin to be troubled by difficulty in swallowing. This accounts in part for the signally unsuccessful results of treatment in a curative way. Janeway states in the report of the Memorial Hospital for 1917 that the esophagus should be a most favorable location for early recognition of treatment by radium, because it occurs in a region where obstruction to swallowing would naturally be an early symptom. In our experience, on the contrary, we have several times found the disease well advanced in cases in which difficulty in swallowing has been noticed a month or less.

Pain has been, in our experience, frequently absent, especially when the middle and lower thirds of the esophagus have been the regions involved. One patient with the lesion in the upper third complained only of slight discomfort in swallowing and occasional slight hemoptysis, and yet esophagoscopy showed an advanced actively proliferating growth at the level of the cricoid. However, this is unusual.

The most favorable location for early recognition is the upper end of the esophagus because, here, as a rule, dysphagia and pain occur relatively early.

In the treatment of cancer of the esophagus with radium we are confronted with serious obstacles. Esophagoscopy has rendered the diagnosis of the site and nature of the lesion a relatively simple matter, but it is usually impossible to determine accurately its size and extent. The surface application of radium by means of bougies loaded with radium tubes has in our hands been productive of only discomfort and aggravation of symptoms without any beneficial results. This method was at best inaccurate and liable to cause burns of the normal epithelium on account of the dislodgment of the applicator from the original position in which it was placed. The method of permanent implantation of small tubes of the emanation seemed to be worth trial, and during the past year I have treated a series of eighteen cases by this method.

It had at least one advantage, namely, that the operator was enabled not only to see where the dose was inserted, but to know that it would remain in the same spot until it had destroyed the tissue in its vicinity. If it moved as a result of this destruction it seemed probable that the movement would tend to be downward as the result of the action of gravity and the muscular movements of deglutition. If the radium were inserted into the top of the growth it might thus be expected to destroy some of the tissue below.

Radium seeds of a value from 1 to 3 mc. have been shown to have an area of effective radiation of about 1 cm. in diameter. Large seeds have a slightly greater but not proportionately greater area of radiation.

The destruction by radium is an element of danger which must be reckoned with in placing the seeds, since perforation of the wall of the esophagus into the aorta or into a bronchus may result from an implantation too close to the outer wall. I have recently seen the autopsy in a case in which perforations into both aorta and left primary bronchus occurred.

The technic of the method I have employed has been as follows:

Under ether a medium-sized Mosher esophagoscope is passed down to the growth, the field cleared by suction and a seed inserted into the most prominent portion of the growth to a depth of about 1 cm. The trocar used for this purpose is made of sufficient length to be passed through a seventeen-inch esophagoscope and suffi-

ciently heavy and rigid not to bend enough to interfere with accurate placing and insertion of the point when the instrument is held at its proximal end. The usual dosage has been about 5 mc. in single tubes or distributed in two or three tubes.

The following case may be taken as fairly typical of the course of the disease under treatment by the method outlined:

R. E. S., a woman, aged fifty-five years, consulted me on December 9, 1920, on account of difficulty in swallowing, first noticed six months previously. For the past two months she had been able to take nothing but liquids, and these with increasing difficulty. There had been marked loss of weight, and she presented a decidedly emaciated appearance. *X*-rays taken before I saw her showed a constriction of the esophagus just below the arch of the aorta, extending about four inches downward.

On December 16 an esophagoscopic examination showed a red, granular, tumor mass obstructing the lumen at ten and three-quarters inches from the teeth. This mass appeared to be growing from the right side from about three-quarters of the circumference. A very small lumen could be seen in the left anterior quadrant. A specimen was removed for examination, and one seed, 7 mc., was inserted into the center of the presenting mass. A No. 26 French bougie was passed into the stomach.

Histological examination of the specimen was made by Dr. J. H. Wright, who reported squamous-cell carcinoma.

This patient had two subsequent treatments at three- and four-week intervals. The esophagoscopic examinations showed some sloughing and ulceration in the region of the insertion of the seed, but no noticeable change in the size of the lumen.

The patient got along fairly comfortably for three months and had no difficulty in swallowing liquids during this time, and the weight remained almost stationary. During the latter part of March she began to be troubled by cough on taking nourishment. This became so severe that a gastrostomy was advised and was performed on March 30. Five days later she had a sudden, severe hemoptysis and died.

The autopsy showed an annular carcinomatous mass involving the wall of the esophagus for about six inches from the level of the bifurcation downward. There was a posterior fistula into the aorta and an anterior one into the left primary bronchus. The latter lesion undoubtedly was responsible for the onset of cough.

Most of the cases were able to swallow liquids up to the end, and many of them gained weight temporarily. In only one case was I able to obtain a definite view of the whole tumor and thus have an opportunity to insert the radium effectively. The tumor in this case was situated on the anterior wall back of the cricoid. Six weeks after the first treatment the patient had gained six pounds, was relieved of the pain which had been intense in swallowing and the growth had dinimished in size by about one-half.

Another patient who has been under treatment for six months, during which he has had four radium insertions, is still able to swallow liquids, though now failing markedly in weight and strength.

In general, I think it may be stated that patients can be given a moderate degree of relief for two or three months by this method. It has been possible to accomplish this degree of palliation with relatively little discomfort from the treatment.

Of the 18 cases treated by this method, 15 were males and 3 were females. The tumor was located in the upper third of the esophagus in 6 cases, in the middle third in 3 cases and in the lower third in 9 cases. The youngest was forty-five and the oldest sixty-five years of age. The average age was fifty-seven years. The average duration of life after beginning treatment was three and one-half months.

Four patients are under treatment. Only one of these is showing definite improvement in the local condition and in general health. Another who has been under treatment for five months is gaining weight and swallowing better, but the local process as shown by the esophagoscope is still active. The remaining two are rapidly failing. One of these has been under treatment seven months and the other five months.

It is unfortunate that out of this series we were able to get only one autopsy. That case, to which I have already referred, showed a double perforation into the aorta and into the left primary bronchus.

In nearly every instance the patient was able to swallow liquids up to the end, and gastrostomy was advised only twice.

REPORT OF A CASE OF CARCINOMA OF THE LARYNX AND ONE OF SARCOMA OF THE NASOPHARYNX TREATED BY RADIUM

JOHN R. WINSLOW, M.D.

Opinion as to the value of radium in the treatment of malignant tumors of the nose and larynx, as expressed in current rhinolaryngological literature, may, I think, be fairly summarized as pessimistic.

In papers and discussions presented to our own and other associations in recent times by Delavan, Beck, Watson, Sonnenschein and others, members have so expressed themselves. I will quote a few:

Dr. C. W. Richardson, Washington, D. C.: "My experience has not been such as to warrant my keeping up my enthusiasm."

Dr. J. Payson Clark, Boston: "I have not been much encouraged in regard to the curative effect in advanced cases."

Dr. Lewis A. Coffin, New York City: "I have become thoroughly discouraged as to its use in malignancy."

Dr. Norval H. Pierce, Chicago: "I believe that if we depend upon radium for a cure in the early stages of laryngeal carcinoma we will have about as much effect beneficially as if we depended upon faith."

Dr. Joseph C. Beck, Chicago: "I fully realize the great possibilities of radium for curing malignant disease, but thus far, in my experience of nearly sixteen years, it has not demonstrated the value."

In view of this skepticism, and in the interest of science and humanity, I feel that it is our duty to report all cases of unquestionable diagnosis and authentic results; in this spirit I present the following case histories.

The following is a supplementary report upon a case informally reported by our late Fellow, Dr. Jacob H. Hartman, in our *Trans-*

actions of 1916. The details of the treatment were not then available, and I wish to record these, as well as the ultimate outcome, after a period of eight years and eight months, during which time the patient has been under my personal observation.

Case I. *Carcinoma of the Larynx Cured by Radium.* On July 31, 1913, Harry R., aged fifty-six years, white, a bookkeeper, consulted me upon the advice of Dr. Hartman. He complained of difficulty in swallowing and respiration, but no pain. The voice was fairly clear. These symptoms had existed about nine months, during two of which he had been under the care of his family physician, who referred him to Dr. Hartman. The patient was rapidly losing flesh, but a sputum examination proved negative as to tuberculosis and a Wassermann as to syphilis. There was no glandular enlargement in the neck.

Laryngoscopic examination revealed a large lobulated intralaryngeal tumor, presenting a smooth, unulcerated surface of a red color. This was the size of a small English walnut, apparently attached to the left arycartilage, from which a tongue-like projection extended beyond the larynx into the hypopharynx. The latter was unattached, so that the tumor was entirely intrinsic. The right arycartilage was infiltrated, but not attached to the tumor. The anterior portion of the larynx and the vocal cords were not visible, and the larynx appeared so filled up as to render breathing impossible, and yet dyspnea was not striking at this period.

I agreed with Dr. Hartman in considering the growth malignant and gave an unfavorable prognosis, but suggested the use of radium. A specimen was subsequently removed by Dr. Hartman and submitted to Dr. Standish McCleary, pathologist at Mercy Hospital, for examination, who reported that it was a carcinoma. This was subsequently confirmed by Dr. Burnam (see photomicrograph). The condition was explained to the patient and he agreed to undergo radium treatment at the Kelly Hospital, for which arrangements were made with Dr. Curtis F. Burnam.

Owing to the development of extreme dyspnea, it became necessary to perform a tracheotomy on September 14, 1913.

On September 21, he received seven gram hours' radiation applied externally over the larynx. This was screened by 3 mm. of lead and separated from the skin by a gauze pad, 1 cm. thick. Marked dysphagia ensued, so that the patient had to be fed by a stomach tube. In two weeks' time a bad skin burn and ulceration of the neck developed, which caused intense suffering, and took one year to heal, leaving an extensive cicatrix around the neck anteriorly.

The patient was examined by Dr. Hartman on October 6 (two weeks) and the growth had largely disappeared. On October 23 the only vestige of it left was a slight thickening of the left arytenoid. All embarrassment of breathing and swallowing had ceased.

In November, 1913, the larynx was reëxamined by myself and only a slight tumefaction of the left arytenoid was discoverable.

Fig. 1.—Carcinoma of the larynx.

He remained under the observation of Dr. Hartman until April 12, 1916, at which time the larynx was thoroughly clear, with no trace of the growth. He was free from all symptoms and had gained forty pounds in weight.

The patient was instructed to report at regular intervals, and each year since has been examined several times. Aside from acute colds or congestions he has had no trouble, nor has there been any suspicion of return of the disease.

He was last seen and examined May 19, 1921, at which time the vocal cords appeared of a dusky color and somewhat flabby, but the movements were normal. There was no appearance of tumefaction or neoplasm, or indication that there ever had been such. The voice was deep and clear. He was in robust health, weighed 196 pounds and was working hard as an accountant for a manufacturing concern.

I have no hesitancy in pronouncing this case an indubitable cure. It could in no sense have been considered one favorable for cure, being an advanced condition of at least nine months' duration and having attained a great size. The massive application of radium, in what proved to be an overdose, though causing extensive destruction and suffering, undoubtedly insured the result and saved the patient's life. This was one of the first cases treated at the institution. Today, with the modern direct or suspension apparatus, appropriate applicators and radium needles at our disposal, these undesirable consequences could be avoided.

In view of its recent occurrence this should be regarded as a preliminary report:

Case II. *Sarcoma of the Nasopharynx Treated by Operation and Radium.* Carroll R., a white farmer boy, aged nineteen years, was referred to me by Dr. Henry M. Fitzhugh, of Westminster, Md., January 22, 1918. His general physical condition was good, but he complained of inability to breathe through or blow the left nostril. For the greater part of the time he was compelled to breathe through the mouth and his speech was thick and nasal. There had been no pain or epistaxis for over six months, although formerly he had bled daily, at times requiring packing. About June 16, 1917, a nasal growth was removed by another surgeon at the Baltimore Eye, Ear and Throat Hospital, and a specimen referred for pathological examination, but no report was recorded.

Upon examination the right nostril was found to be unobstructed and normal. The left nostril contained a fusiform growth, exhibiting movements upon swallowing or when manipulated with a probe. This extended from about the middle of the naris backward and occupied the naris from the floor up, although a probe could be passed beneath it. Upon inspection through the mouth the uvula and velum were seen to be strongly protuberant and a rounded mass was seen extending below the palatine border toward the left. Upon elevating

the palate with a hook a voluminous tumor was seen completely occupying the epipharynx.

In the mirror this presented a red, smooth surface, and upon palpation felt dense but elastic; both choanæ were concealed by the growth.

FIG. 2.—Sarcoma of the epipharynx, alcoholic specimen. Measurements: 8.5 x 3.5 cm. Weight, 20 gm.

A tentative diagnosis of fibroma or myxofibroma was made. A specimen was then removed with biting forceps through the mouth and submitted to Dr. H. J. Maldeis (University Hospital) for examination, who subsequently reported the growth to be a myxosarcoma. The section was later reviewed by Dr. Burnam, who considered the growth a small-cell sarcoma.

The patient was admitted to my service at the University Hospital, January 30, 1918. Besides the usual preliminary preparation calcium lactate was administered for twenty-four hours. The operation was performed January 31, 1918, at 2.30 P.M. I was assisted by Drs. C. A. Reifsneider and E. Cafritz, of the hospital staff. Fearing a gush of blood and suffocation I performed a preliminary middle tracheotomy and packed the hypopharynx with gauze, ether vapor being administered through the tracheotomy tube by Dr. Samuel Moore. Under anesthesia, a finger examination showed the tumor to be attached by a broad pedicle to the upper outer angle of the epipharynx and rim of the left choana, with an extension forward into the naris.

The patient was placed upon an inclined table and practically stood upon the back of his head, being held firmly in this position by an assistant. Under illumination with a headlight the tumor was seized by heavy serrated tonsil forceps and pulled down forcibly. A heavy

raspatory (Escat's) was introduced behind the tumor, and under guidance of the gloved fingers as much as possible was separated from its basal attachment. By this procedure the tumor was brought well into view and the remaining anterior attachments were severed with heavy curved uterine scissors. Contrary to expectation the hemorrhage was not excessive, was readily arrested by hot sponges and no permanent tamponade was required. The growth was of the consistency of solid rubber and very difficult to cut.

At the termination of the operation, which lasted one and one-half hours, the general condition of the patient was good. His postoperative record was one of progressive improvement, but little prostration ensued and the temperature never exceeded 100° F.

The tracheotomy wound was closed immediately and healed promptly. Within ten days the patient regained his vitality, looked and felt well and ate enormously; upon one occasion I caught him sitting up in bed biting chunks out of a big pie.

On February 8, 1918, postnasal examination with the mirror revealed a mass of tissue remaining at the upper outer angle of the epipharynx. Anterior nasal examination showed a remnant of the forward extension in the left naris. February 13, under ether, I removed as much as possible of this tissue with the largest Grünwald forceps, but had to desist and pack the nose and pharynx on account of hemorrhage.

Convalescence was rapid and uneventful and the patient was able to leave the hospital February 22, 1918, a little over three weeks from the date of operation.

Soon after his return home the patient acquired an infectious cold, complicated by an acute otitis media and by a rather severe nasal hemorrhage. These occurrences pulled him down considerably, so that he was unable to revisit me until April 29, 1918, a period of over two months. At this time he looked and felt well, and weighed 180 pounds. He could blow his left nostril but could not breathe through it. Examination revealed a recurrent rounded growth, the size of the end of my thumb, blocking the left choana, also a cylindrical projection within the nostril.

Both the patient and myself being averse to further surgery I sought the assistance of the radium department of the Howard A. Kelly Hospital, and through the courtesy of Dr. Curtis F. Burnam obtained my first personal experience in radium treatment. The dosage and method were prescribed by him. On May 1, 1918, I applied with a postnasal applicator a brass capsule containing 904 mg. of the emanation of pure gamma rays. This was applied for two minutes each, at three points, anteriorly and posteriorly, making six minutes in all.

May 8 the tumor appeared (mirror) red and swollen and presented a slough at its lower portion at the points of contact with the radium.

May 15 I applied simultaneously against the tumor, with an appropriate applicator, 500 mgr. emanation ten minutes through the anterior naris and 765 mgr. emanation five minutes through postnasal space.

May 30, examination showed the growth to be visibly shrunken around its periphery and the patient could blow the nose better. At this time I applied 500 mgr. of emanation twenty minutes through the anterior naris.

June 6 a plate electrode, dose unknown to me, was applied over the left antrum externally for four hours.

June 21 I applied 400 mgr. for ten minutes each, anteriorly and posteriorly. Following this the patient developed measles and treatment had to be suspended.

About this time, as progress had not been sufficiently rapid, I suggested removing as much as possible of the intranasal growth surgically, so as to be able to attack the main tumor at its center through the nose. This idea evidently did not appeal to the patient or his parents, for upon recovery from his sickness he returned to Dr. Burnam on August 1, 1918, with the statement that he had "backed out of the operation." Thus he passed out of my personal treatment for a considerable period of time.

On this date Dr. Burnam instituted a different method of treatment by burying a tiny point, containing 1 mc. of emanation, in the anterior part of the growth. This plan of treatment proved eminently satisfactory and was continued thereafter, at times through the nose, but mostly postnasally. Minute glass needles, the diameter of a small pin-shaft and one-half inch long, containing from 1 to 5 mc. of radium emanation, were implanted directly into the growth at intervals of from four to six weeks. Numerous implantations were made during the latter part of 1918 and the whole of 1919 up to November 25.

At one time (May, 1919) two needles, 5 mc., were implanted at one sitting postnasally. This caused a severe reaction; the patient's tongue and soft palate became swollen, blistered and sore, so that swallowing was difficult.

After November, 1919, no further implantations were made. In all the patient had received about thirty implantations.

The remaining (three) treatments in 1919 and the few (five) in 1920 were by direct application, for fifteen-minute periods, of a sound containing the equivalent of 500 mg. of radium in the form of emanation. The last application was June 14, 1920, except a very small

treatment given in December for five minutes to dry up a granular area.

In this connection a brief review of the clinical pictures during this period is of interest. Prior to 1920 there was little improvement in the appearance or symptoms, although the patient's general health was benefited.

February 7, 1920, I examined the patient and found an ovoid postnasal mass covering the left choana, except at its inferior inner angle. The lower border presented a slough, presumably caused by radium. A club-shaped intranasal growth persisted. He stated that he breathed well and felt finely.

July 17, 1920, the postnasal growth was reduced to a narrow tongue-like strip alongside of the vomer. The patient breathed well, felt well and worked hard.

August 19 the postnasal growth was much shorter and thinner; the endonasal growth was contracted.

September 18 the postnasal mass had dispapeared; the endonasal mass was confined to the posterior third of the nose and was best viewed postnasally. The patient breathed well, worked hard at a cannery and had no complaint except crusting of the nose.

January 3, 1921, no anterior growth was visible. A slight synechia existed between the middle turbinal and septum anteriorly. No postnasal tumor was present. A small mass was seen just within the left choana, high up in the nose (synechia). A smooth cicatrix existed at the upper outer angle of the nasopharynx just behind the choanal rim, evidently the original site of implantation of the neoplasm. The patient had no symptoms except crusting. He douches the nose with salt solution daily, feels finely and works hard in a quarry; looks well and weighs 208 pounds.

May 23, reëxamination showed the left choana filled with a hard crust, upon removal of which with a syringe and mop the same picture was displayed as previously described. The patient weighs 207 pounds and works hard, driving a tractor for the County Roads Commission.

Is this Case Cured? Cure is a matter not of definition but of experience—time is the ultimate test. Whether we accept an arbitrary standard of three to five years' freedom from recurrence or not the patient should report at intervals for an indefinite period. This case is of too recent date to be considered cured. He has, however, gone for practically one year without treatment and there

is no evidence of recurrence. A fair designation of the case would seem to be "very hopeful."[1]

Should Radium Alone have been Employed in this Case from the Outset? Making due allowance for delays caused by sickness and severe winter weather it would seem that this tumor showed itself to be very resistant to radium. As it required nearly two and one-half years' treatment to destroy the relatively small recurrence, I cannot imagine what time would have been required for the removal of the original large growth. I believe that the employment of surgery in combination with radium was good practice.

Radium is a metal, but has very rarely been produced as such. The usual product is a radium salt—bromide, sulphate, carbonate or chloride. Radium emits three distinct rays: alpha, identical with positive static electricity, constituting 90 per cent of the total emanations; beta, which is negative static electricity, forming 9 per cent of the emanations; gamma, a real ray or vibration, forming 1 per cent of the emanations.

In the treatment of cancer the gamma rays alone are used, the remaining ones being removed by screens of metal and other substances.

For the following résumé of the methods of application of radium employed at the Howard A. Kelly Hospital, Baltimore, I am indebted to articles by Dr. Howard A. Kelly and Dr. William Neill, as well as to information imparted personally by Dr. Curtis F. Burnam.

The radium salt is dissolved in a weak acid solution in a closed glass receptacle, and from this the active gaseous principle or emanation is pumped off day by day with a mercury pump and conveyed to a minute capillary glass tube. This is then sealed and cut off, and can be easily transported and applied whenever desired. Another advantage consists in the fact that the active material of a whole gram of radium salt, which would fill a small teaspoon, can thus be accommodated in a tiny glass button not as large as the head of a common pin.

A valuable method of application consists in implanting directly

[1] This patient was reëxamined January 20, 1922, and showed no evidence of recurrence.

into the tumor tiny capillary glass tubes, containing from 3 to 5 mc. of radium emanation, the equivalent of the maximum yield of 3 to 5 mg. of radium. These tubes are inserted into needle-pointed steel applicators of various shapes (nasal, postnasal, laryngeal, etc.), which are plunged into the tumor. The radium tube is then forced from the applicator by means of a stilet and the instrument withdrawn, leaving the radium in the tissues. As many of these as is deemed necessary, or safe, may be inserted into a growth, where they give a tremendous radiation, gradually losing their strength in about five days. One plan employed is to map out the tumor so that each cubic centimeter shall receive 2 mc. of radiation. This form of treatment should never be repeated oftener than four to six weeks. In association with this, or independently, the emanation may be applied in a brass or platinum capsule attached to a sound, which is held directly upon the tumor. In this way the equivalent of 1 gram of radium, or even more, in the form of emanation, may be applied for from five to fifteen minutes. Applications may be made once a week, according to the reaction, for as long a period as seems indicated. When used for prolonged periods this method is attended with some risk for the operator.

Conclusions. We should not form final opinions as to the value of radium from the earlier case reports. An inadequate supply of radium and inexperience in its use have been the cause of many accidents and failures in the past, and at times the supposed radium was spurious. Only comparatively recently have adequate amounts of radium been collected and the technic of its preparation and application is being constantly improved. According to Harry A. Mount the maximum amount of extracted radium existent in the world today is only about five ounces, which is being increased by an annual production of about one ounce. This should not be distributed among too many individuals owners, and some governmental or central control would seem desirable. The application should be in the hands of a few experts who have a sufficient amount of radium available and experience in its use. A maximum dose is often required, and cases will yield to heavy dosage that have resisted lesser ones. This dosage varies and must be determined in each individual case, which requires experience, judgment

and sometimes daring on the part of the operator. At times accidents occur, such as burns, destruction of tissues and organs, hemorrhage, toxemia, disturbance of internal secretions and meningitis. While these injurious effects can now be largely avoided, nevertheless, those who seek cure by radium must be prepared to pay the price, not only in money but in damage sustained. Most of these ill effects, however, are a small price to pay for one's life.

Of these two cases reported the first suffered considerable damage from an overdose, and in the second the dosage approached perilously near to injury; and yet in both I am convinced that life was saved by adequate dosage.

In a recent interview Madame Curie claims that "Cancer can always be cured by radium if used in sufficient quantity by those who know how to use it."

Personally, I believe that radium has a greater future than a past, and will ultimately supplant surgery in the treatment of malignant diseases of the nose and throat.

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RADIUM IN THE TREATMENT OF CARCINOMA OF THE LARYNX, WITH A REVIEW OF THE LITERATURE

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Laryngeal carcinoma, one of the saddest afflictions with which the laryngologist has to deal, has for many years been a vexatious problem, and indeed will no doubt remain so until the scientists and investigators have been able to determine more accurately its etiology. For this reason, no doubt, our efforts at local eradication have been much hampered.

With the advent of radium, and its effect upon cancerous growths in other regions of the body, our optimism became apparent, and during the last few years we have been striving to determine the value of radium in the treatment of cancer of the upper respiratory tract, the larynx in particular. Most of us have used it in all stages of the disease. The results are varied and confusing. Some report cures; the majority failures. Most text-books condemn it.

Janeway, in the Memorial Hospital Report of 1917, reports twenty-seven cases of cancer of the larynx which were treated by radium. All were dead at the time of the report but one, and he was being treated for recurrence. Janeway was of the opinion that much better results should be obtained by radium in the larynx, judging from the effects on similar growths situated elsewhere. These cases were treated by means of tubes inserted into the larynx and plaques applied to the neck.

Dr. Douglas C. Quick, of the same institution, exhibited before the Eastern Section of the American Laryngological, Rhinological and Otological Society, in February of this year, two cases of carcinoma of the larynx in which remarkable results were obtained. These cases had been treated by the insertion of radium emanations into the growth.

Dr. Delavan, in the *Transactions* of this Association for 1919,

reports four cases of laryngeal carcinoma treated by radium. Two had complete laryngectomies after being thoroughly treated by radium and two of his cases were treated by radium alone, which showed complete retrogression.

Jackson and Patterson, in their book on *Peroral Endoscopy and Laryngeal Surgery*, report a laryngeal carcinoma treated by radium which was applied directly to the growth, and the patient lived for one year following the treatment.

Dr. A. W. Watson, in the *Transactions* of this Association for 1917, reports one case successfully treated by external and internal applications of radium.

Dr. y de Barajas, in *Medicina Ibera*, Madrid, Spain, 1919, reports fifty-eight cases treated by radium, with not one complete cure. He states that the growths undergo a process of amelioration even to apparent cure after the first application of radium if dosage is adapted to the case and to the subject. All cases, however, he states, recurred in a very short time. He finds that the dosage in the larynx should not be less than 45 to 50 mg., nor more than 75 to 80 mg., with a maximum duration of two hours in each application, and should be made as frequently as reaction after treatment will permit. He also further states that radium merely retards the development of some varieties of cancer, hastens it in others and completely cures none.

The writer has treated sixteen cases of carcinoma of the larynx with radium since January, 1917, with the following results: One case in which total laryngectomy had been performed, which had recurrence in the thyroid gland died six months after operation. Another in whom a complete laryngectomy was performed two weeks ago has had large doses of radium within the larynx and radium plaques applied externally for the past year. While doing nicely it is too early to record accurate results. Another, in which thyrotomy had been performed, with recurrence of the disease in the external wound, was treated by radium needles and died eight months after the thyrotomy. One with early involvement on the right side of the larynx was treated by radium needles inserted directly into the growth, had early retrogression, later showed signs of beginning activity, was thyrotomized, and with the assistance of Dr. William L. Clark was treated with electric coagulation.

The patient is still living and there is no evidence of recurrence after four months.

The remaining twelve cases, which were considered inoperable, were tracheotomized and treated vigorously by introducing needles into the growth and radium applied externally under the direction of Dr. William L. Clark and Dr. William S. Newcomet. All are dead but one, who is losing ground rapidly.

In two of these remaining twelve cases there was marked retrogression of the growth, so much so that the site of the lesion was hardly perceptible and the patient's condition remained so for several months; recurrence developed, and in spite of the use of radium they died in about a year after their first treatment.

Out of 109 cases above recorded 10 were living at the time the reports were published, showing a mortality of about 91 per cent.

The method of applying radium in the cases which came under our observation was as follows: The first three or four cases were treated by introducing the capsule, properly screened, into the larynx, after the patient had been thoroughly cocainized, using a 20 per cent cocain solution within the larynx, preceded by a hypodermic of $\frac{1}{4}$ grain of morphin sulphate. The radium was held in position after the manner described by Jackson and Janeway. Later, $8\frac{1}{3}$ to $12\frac{1}{2}$ mg. needles, to which strings were securely tied, were introduced into the growth, the number depending upon the size of the lesion. These were left in position in some instances for seven to twelve hours. In addition to the needles external applications were also used.

From reports the writer is of the opinion that more recent improved technic in the use of radium emanations, as practised at the Memorial Hospital in New York, offers more encouraging results.

Conclusions. From the writer's experience and from published reports it would seem that radium is only indicated in the so-called inoperable cases of carcinoma of the larynx, meaning those cases in which there is marked involvement of the cervical glands, epiglottis, base of the tongue and the esophageal wall. Its analgesic effect in these cases in moderate doses constitutes one of the most important benefits. It is valuable for those patients who

refuse operation. It perhaps exercises a beneficial effect in blocking the lymphatics before a radical operation upon the larynx. Such brilliant results have been obtained in early intrinsic malignancy of the larynx by thyrotomy that in these cases radium should not be thought of except possibly as a postoperative measure. In the more advanced type of intrinsic cancer of the larynx laryngectomy has prolonged the lives of many by surgeons in all parts of the world. Here, again, radium should not be considered a means of treatment except before or after operation.

Case I. T. H., white, male, aged eighty-three years. Carcinoma of the larynx, cervical glands and base of the tongue. Admitted to Jefferson Hospital October 23, 1917. The patient died without improvement December 29, 1917.

The following is the treatment by Dr. Newcomet:

100 mg. four hours, placed at various places on the neck around the tube that was inserted in the throat.

October 23. 100 mg. 4 hours on the right side of the neck toward the front.

October 25. 100 mg. 3 hours on the left side of the neck (front).

October 27. 100 mg. $3\frac{1}{2}$ hours under the chin directly above the tube.

October 30. 100 mg. 4 hours on the left side of the neck low down below the level of the tube. Examined. No reaction yet. To have one more treatment on the right side and one directly under the tube.

November 1. 100 mg. $3\frac{1}{2}$ hours on the right side of the neck low down below the level of the tube.

November 3. 100 mg. $3\frac{1}{4}$ hours on the neck low down under the tube. Examined. No reaction yet but to be laid off for ten days. Return November 13.

November 13. Examined. No sign of reaction yet. Patient to return in one week.

November 20. 100 mg. 4 hours on the right side of the neck about on a level with the tube and toward the side of the neck.

November 26. 100 mg. 4 hours on the left side of the neck about on a level with the tube and toward the side of neck.

December 29. Patient died about four days ago.

Case II. E. M., white, male, aged sixty-one years. Admitted to Jefferson Hospital August 9, 1920. Carcinoma of the larynx, intrinsic.

Operation refused. Patient still living but growth is beginning to involve the esophagus.

The following is the treatment by Dr. Newcomet:

August 9. 50 mg. 3 hours on the right side on the median line of the neck near the larynx. 50 mg. 3 hours on the left side of the median line of the neck. Filter 1 mm. lead 1 in. bandage filter.

August 11. 100 mg. 3 hours over the larynx on the median line of the neck. Filter 1 mm. lead 1 in. bandage.

August 13–14. 100 mg. 3 hours on the neck below the level of the larynx. 100 mg. 4 hours on the right side of the neck, high. 100 mg. 4 hours on the right side of the neck, low. 100 mg. 3 hours on the left side of the neck. 100 mg. 3 hours on the neck above level of the larynx. Filter 1 mm. lead 1 in. bandage. (100 mg. 17 hours on the neck.)

Case III. M. K., white, male, aged sixty years. Carcinoma of the larynx and esophagus. Admitted to Jefferson Hospital March 13, 1920. Died April 14, 1920.

The following is the treatment by Dr. Newcomet:

March 16. 50 mg. 2 hours in the larynx. Radium in a silver tube covered with rubber placed by Dr. Lewis.

March 16. 100 mg. 3 hours on the left side of the neck above the level of the larynx, a little to the left of the median line. Radium in 2 mm. lead and 1 in. bandage filter.

March 17. 100 mg. 3 hours on the center of the neck below the larynx.

March 17. 100 mg. 3 hours on the right side of the neck above the level of the larynx.

March 17. 100 mg. $3\frac{1}{2}$ hours on the right side of the neck below the level of the larynx. Patient to return April 6 for examination.

April 6. 100 mg. 3 hours on the left side of the neck under the angle of the jaw. 100 mg. 3 hours on the left side of the neck about one inch lower than the previous treatment. 100 mg. 3 hours on the left side of the neck about one inch lower than the previous treatment. 100 mg. 3 hours on the right side of the neck under the angle of the jaw. 100 mg. 3 hours on the right side of the neck about one inch lower than in the previous treatment. 100 mg. 3 hours on the right side of the neck about one inch lower than in the previous treatment.

Patient was admitted to the hospital April 2 and gastrostomy was performed. Patient had not eaten for three days. On April 6 he was able to swallow water without difficulty.

Case IV. L. B. M., male, white, aged fifty-five years. Carcinoma of the larynx with involvement of the cervical glands. Admitted to Jefferson Hospital August 26, 1919. Died October 12, 1919. Conscious almost to time of death.

The following is the treatment by Dr. Newcomet:

August 26. 50 mg. 20 hours.

September 11. Examined. Not much reaction. Has been coughing up a great deal of mucus in the last three days. Has had several weak spells, when he almost fainted. To be treated again as before.

September 11. 50 mg. 20 hours. Radium in lead tube placed over one-half in. bandage in lead collar. Radium in ten positions, moved every two hours.

September 16. Examined. No change in condition. Patient still has a great deal of pain.

October 2. 40 mg. $3\frac{3}{4}$ hours on the left side of the neck under the ear.

October 6. 50 mg. 3 hours on the left side of the neck near the tracheotomy tube.

October 6. 40 mg. 3 hours on the right side of the neck near tube.

October 8. 40 mg. 3 hours on the right side of the neck near the ear.

October 8. 50 mg. 3 hours on the left side of the neck, low, near collar-bone. Neck seems less swollen. Patient is feeling a little better.

October 11. Patient had severe pain in the right side of the abdomen near the border of the ribs. Coughed up a great deal of very foul pus.

Case V. P. J. C., male, white, aged sixty-four years. Carcinoma of the larynx, intrinsic. Laryngectomy, August 21, 1919. Recurrence in the thyroid gland. Died six months after laryngectomy.

The following is the treatment by Dr. Newcomet:

April 19. 90 mg. $3\frac{1}{2}$ hours on the left side of the neck. Radium in 1 mm. lead 1 in. bandage. 140 mg. $2\frac{1}{2}$ hours on the right side of the neck over the abscess. 140 mg. 3 hours on the right side of the neck near the angle of the jaw. 140 mg. 3 hours on the right side of the neck on the collar-bone near the median line. 140 mg. 3 hours on the right side of the neck about three inches from the tracheotomy tube and level with the tube. 140 mg. 3 hours on the left side of the neck under the angle of the jaw. 140 mg. 3 hours on the left side of the neck.

Case VI. E. R., male, white, aged sixty-five years. Carcinoma of the larynx with involvement of the cervical glands. Admitted to Jefferson Hospital May 4, 1920. Died July, 1920.

The following is the treatment by Dr. Newcomet:

May 4. 50 mg. in the larynx above the cords. Radium in silver tube covered with rubber, placed by Dr. Lewis. Patient coughed up the tube after it had been in the throat for less than ten minutes.

May 4. 40 mg. $3\frac{1}{2}$ hours on the median line of the neck above the level of the larynx. 40 mg. 3 hours on the right side of the neck above the level of the larynx about two inches from the median line. 40 mg. 3 hours on the right side of the neck below the level of the larynx 2 inches from the median line. 40 mg. 3 hours on the left side of the neck above the level of the larynx, 2 inches from the median line. 40 mg. $3\frac{1}{2}$ hours on the left side of the neck below the level of the larynx, 2 inches from the median line. 1 mm. lead 1 in. bandage filter.

May 5. 140 mg. $3\frac{1}{2}$ hours on the median line of the neck at the top of the sternum. 140 mg. 3 hours on the left side of the neck below the angle of the jaw near the jaw-bone. 140 mg. 3 hours on the left side of the neck below the angle of the jaw near the collar-bone. 140 mg. 3 hours on the right side of the neck below the angle of the jaw near the jaw-bone. 140 mg. $3\frac{1}{3}$ hours on the right side of the neck below the angle of the jaw near the collar-bone. 1 mm. lead 1 in. bandage filter.

May 27. 100 mg. 3 hours on the right side of the larynx a little below the level of the larynx.

May 28. 100 mg. 3 hours over the larynx.

May 28. 100 mg. 3 hours above the larynx. 100 mg. 3 hours on the left side of the larynx.

May 29. 100 mg. 3 hours on the right side above the larynx.

June 24. Choked up. Feels poorly. To be treated twenty-four hours on the neck on July 9.

July, 1920. Patient wrote that he was unable to come for treatment. Too weak to travel.

Case VII. J. P., male, white, aged sixty years. Carcinoma of the larynx, intrinsic. Admitted to Jefferson Hospital July 7, 1920. Operation for thyrotomy, July 9, 1920. Died February, 1921.

The following is the treatment by Dr. Newcomet:

July 7. 100 mg. $2\frac{1}{2}$ hours on the neck at the top of the larynx. 100 mg. 3 hours on the neck over the larynx, a little lower than in the previous treatment. 100 mg. 3 hours on the neck at the lower border of the larynx. 100 mg. 3 hours on the right side of the neck about three inches from the median line at the upper edge of the neck. 100 mg. 3 hours on the right side of the neck at the lower part of the

neck. 100 mg. 3 hours on the left side of the neck about three inches from the median line at the upper edge of the neck. 100 mg. 3 hours on the left side of the neck at the lower border of the neck. Filter 1 mm. lead 1 in. bandage.

July 24. No change.

July 27. Patient's throat, although inflamed, appeared better.

August 14. Referred to dispensary.

Septemper 9. Repeat application. Treatment was considered necessary over the sore spot on the median line of the neck.

September 28. 100 mg. $3\frac{1}{2}$ hours on the median line of the neck over the sore area from which pus is draining. 1 mm. lead 1 in bandage. Examination showed that disease had not progressed but is still confined to small area around the larynx. 100 mg. 3 hours on the neck below the level of the larynx. 100 mg. 3 hours on the neck above the level of the larynx. 100 mg. 3 hours on the right side of the neck (high). 100 mg. 3 hours on the right side of the neck (low). 100 mg. 3 hours on the left side of the neck (high). 100 mg. 3 hours on the left side of the neck (low). Filter 1 mm. lead 1 in. bandage. 100 mg. 23 hours.

September 29. 100 mg. $1\frac{1}{2}$ hours on the right side of the neck.

October 25. 50 mg. $3\frac{1}{2}$ hours over the sore spot over the larynx on the median line of the neck. 1 mm. lead 1 in. wood filter.

October 28. Examination showed extending upward from the sternal notch to the cricoid cartilage midline a scar, in the middle portion of which there was an ulceration about 1 cm. long, slit-like, surrounded by a number of small nodules. Patient's voice was about the same as before operation, speaking only in a whisper.

November 1. 100 mg. $24\frac{1}{2}$ hours on the neck in eight positions for about three hours each. Filter 1 mm. lead, 1 cm. wood. Four positions on the right side of the neck, three and a half, three, three, three hours each. Three positions on the left side of the neck three hours each. One position three hours over the ulcerated area on the center of the neck.

November 9. No gross change.

November 23. Patient improved. No treatment deemed necessary.

December 14. Doing well.

December 28. Some discomfort.

January 3, 1921. 100 mg. 24 hours in eight positions three hours each on the neck. 1 mm. lead, 1 cm. wood. A large quantity of pus discharging from the opening in the throat. Patient feeling worse.

February 1. 50 mg. 6 hours, four needles around the hole in the neck over the area of the larynx, two on each side of the median line placed in the skin at the edge of the opening.

Case VIII. H. L., male, white, aged seventy-five years. Carcinoma of the larynx with involvement of the esophagus and the cervical glands. Admitted to the Jefferson Hospital November 23, 1920. Still living, but losing ground rapidly.

The following is the treatment by Dr. Newcomet:

November 23. 100 mg. 2½ hours on the median line of the neck above the level of the tracheotomy tube. 100 mg. 3 hours on the right side of the neck. 100 mg. 3 hours on the right side of the neck. 100 mg. 3 hours on the right side of the neck. 100 mg. 2 hours on the right side of the neck. 100 mg. 3 hours on the left side of the neck. 100 mg. 3 hours on the left side of the neck. 100 mg. 3 hours on the left side of the neck. 100 mg. 3 hours on the left side of the neck. Filter 2 mm. lead, 2 cm. wood. (100 mg. 25½ hours.)

November 30. Felt better. Told to return in two weeks.

December 14. Referred to Dr. Lewis.

January 4. No overreaction.

The following cases were treated in conjunction with Dr. William L. Clark:

Case IX. G. A., male, white, aged fifty-five years. Admitted to the hospital March 8, 1919. Carcinoma of the larynx and esophagus. Died about one year after the beginning of the treatment. Radium treatment began May 28, 1919.

May 28. 50 mg. capsule 1 mm. brass filter covered with rubber tubing in the throat for three hours.

July 11. 40 mg. capsule 2½ hours in the throat.

July 25. 50 mg. capsule 2½ hours in the throat.

September 29. 50 mg. capsule 2½ hours in the throat.

Case X. J. A. B., male, white, aged forty-three years. Carcinoma of the larynx with involvement of the cervical glands and the esophagus. Admitted to the hospital May, 1919. Died in June, 1919.

May 14. 50 mg. capsule in 1 mm. brass filter covered with rubber tubing; in throat 6 hours.

June 2. Same as above.

Case XI. J. C. S., male, white, aged sixty years. Carcinoma of the larynx and esophagus. Admitted to hospital August 30, 1920. Died in September, 1920.

August 30. 50 mg. pad ten areas in the cervical region for 4 hours each.

September 8. Five 10 mg. needles, two 5 mg. needles (60 mg.) in the throat for 22 hours.

Case XII. G. G., male, white, aged sixty years. Carcinoma of the larynx, intrinsic. Admitted to hospital October 1, 1919. Died December, 1919.

October 1. 50 mg. capsule in the throat for 3 hours.

October 15. 50 mg. capsule $2\frac{3}{4}$ hours.

November 12. Five 10-mg. needles injected for 12 hours.

December 8. 50 mg. pad cervical gland for 3 hours.

Case XIII. J. W. R., male, white, aged fifty-nine years. Admitted to hospital June 22, 1920. Carcinoma of the larynx with involvement of the cervical glands, tonsils, soft palate and uvula. Died August, 1920.

June 22. Ten 10-mg. $\frac{1}{2}$ mm. nickel and steel needles injected in throat for 16 hours. 12 areas of the cervical region 50 mg. pad 4 hours each.

August 2. 10 areas of the cervical region 50 mg. pad 4 hours each.

Case XIV. K. M., male, white, aged fifty-nine years. Carcinoma of the epiglottis, right side of the larynx and base of the tongue. Admitted to hospital December 16, 1919. Died July, 1920.

December 16. 25 mg. capsule 1 mm. thickness brass filter in larynx for five hours.

March 22. 8 areas on each side of the neck 50 mg. radium in needles in 1 mm. thickness; brass filter, covered with rubber tubing with one-half inch thickness gauze pad.

May 7. 50 mg. capsule in 1 mm. thickness brass filter in the opening in the neck after incision of the gland for twenty hours.

July 12. Five 5 mg. needles (25 mg.) in the larynx for twenty-one hours. 50 mg. pad six areas on the neck for four hours each.

Case XV. C. M., male, white, aged fifty-eight years. Carcinoma of the larynx, intrinsic. Admitted to hospital June, 1920. Thyrotomy and electric coagulation. Still living and no signs of recurrence.

June 28. Four 5 mg. needles (20 mg.) $\frac{1}{2}$ mm. thickness of nickel and steel in throat for five hours. 6 areas of the cervical region, 50 mg. pad four hours each.

August 9. 10 areas of the cervical region 50 mg. pad four hours each.

December 8. 21 areas of the cervical region 50 mg. pad four hours each.

Case XVI. S. S., male, white, aged fifty-seven years. Carcinoma of the larynx. Admitted to hospital May 13, 1921. Treatment with radium before operation. Laryngectomy May 14, 1921. Still living and in splendid condition.

April 27. Three $8\frac{1}{3}$ mg. needles (25 mg.) in the larynx for sixteen hours. 12 areas of the cervical region 50 mg. pad four hours each.

Discussion on Radium

Dr. D. Bryson Delavan, New York City:

The question of biopsy, which was referred to, was, I think, pretty definitely settled about twenty-five years ago, when the matter was under discussion by Sir Henry T. Butlin, Sir Felix Semon and others who were interested in this subject at that time. The general verdict then and since has been against it.

In regard to Madame Curie's alleged remark as to the curability of cancer by means of radium, published through the mistaken zeal of an overenthusiastic newspaper reporter, Mme. Curie, on the contrary, has emphatically insisted that she could promise no such thing. What she has said is that it effects cures in certain types of newgrowths, but that nothing has been proved as to its value in the radical cure of carcinoma.

Much time will be required to establish our knowledge of the efficacy of radium treatment in these cases. Meanwhile more must be learned regarding the effects of the treatment. Many cases must be treated and they must be kept under careful observation long enough to determine the ultimate actual results. This will require a period of years rather than months. Again, the uses of radium itself and the possibilities of its action must be better understood. For that reason it is most desirable that the work of Madame Curie, the most brilliant investigator in this department, should be continued by her. At the present time our watchword should be "patience." No doubt it may require several years to establish much regarding it, but in the meantime it would be well to refrain from opposition based upon theoretical speculation and to study the subject judicially and with open minds.

Dr. Harmon Smith, New York City:

Observing the work of Dr. Janeway and Dr. Smith, from having been more or less intimately associated with them, I think that radium

has more effect on sarcomata than on carcinomata, and particularly lymphosarcomata. Those in the nasopharynx yield more readily and quickly than do carcinomata in that region. I am not breaking confidence in saying that Dr. Janeway was afflicted with a serious tumor of a sarcomatous nature when he was in the mountains with Dr. Brown. A few months after getting there he complained of this tumor. I offered to go and see him, but he insisted that an operation was necessary, and I operated on his nose. I found that it was filled up to the sphenoidal recess with this sarcoma. It was removed. We expected hemorrhage, as usually occurs in these cases; but it bled little or none. Then by his direction I inserted these small needles into the remainder of the tumor and the sphenoidal recess and that vicinity. In a few months he was breathing perfectly. There is nothing observable in the nose but there are metastases elsewhere.

The question arises as to the application of radium before or after operation. Dr. Mackenzie preferred to have the application afterward, but in view of the fact that radium shuts off the channels by which the growth is disseminated I think it should be done before. Its application later further shuts off the lymphatic supply and shrinks the tumor to its smallest compass. One can then operate and have to do the smallest surgical procedure. The mere fact that a tumor is malignant does not speak for the ultimate outcome of operation. There are tumors and tumors. I had a case in which the tumor was removed and radium applied and the growth disappeared. A low order of carcinoma of the larynx that disappears with the application of radium is likely to make us draw the wrong inference. Unless we have some more definite evidence than clinical observation we cannot yet determine the effect of radium on these growths.

Dr. Cornelius G. Coakley, New York City:

I want to speak of one thing that was referred to by Dr. Winslow in describing his operation, namely, that he did a preliminary tracheotomy and then packed the pharynx, so that blood did not enter the larynx. I see that referred to so frequently in literature that I wonder that the method as employed by the Institute in New York is not more generally known. They use a flat tube of which the proximal end is just external to the lip. The distal end passes over the epiglottis and over the arytenoid and the whole pharynx is packed with gauze. This does just what the doctor's technic does, but it saves the patient from tracheotomy and is just as easy to work with, and I am surprised that this method is not known and employed more. The whole tube

can be easily taken out at any time if there is respiratory obstruction, but I have never seen any during even a long anesthesia when given in that way. It seems to me that the great advance in the application of radium has been by the use of the seed method, the use of radium emanations being preferable to that of radium salts. The burns that were so frequently obtained in the earlier methods are avoided. I wonder how necessary it is to have such an apparatus as was exhibited to us by Dr. Freer? Dr. Janeway was the first one that I knew to employ radium within the larynx, and devised a method by which it could be kept there for at least two hours. The statement, as he made it to me, made it seem possible that by simply cocainizing the larynx one could give the patient a suitable curved applicator that he could hold in his larynx for two hours. It did not seem possible to me that the patient himself could hold it in contact with the exact site of application for the required length of time, but this is so.

Dr. Henry L. Swain, New Haven, Conn.:

There is an enormous field for thought in correlating all we have heard today. Of course it cannot be done properly at this moment, but a few things have come into my mind that I should like to speak of: First, I wish to refer to an experience that I had, thanks to Dr. Ingersoll, whom I am sorry I do not see here present at this moment, with a case of apparent lymphosarcoma in the neck. The growth had originally been in the tonsils, and he had been subjected to massive doses of radium within and *x*-ray without. An improvement had resulted and absolute cure had apparently occurred. The patient was sent to me to see whether later on the man might not need more *x*-ray —he living near me. I had the feeling that he did not. Two months later, at the Boston meeting, we had him come on, and we saw him and concluded that he was well. He has since died from metastasis. Numerous metastases were found in the abdominal glands, the liver and the lung.

The question arises, Did the massive dosage locally given have anything to do with driving the thing in, as the laity would put it, and as his family think? Or had the case progressed so far that metastasis had already started before the radium was applied? That is the probable solution, but we must consider the absorption of the products, when so much living tissue is devitalized, and the system must dispose of all that is being formed at the time of such devitalization. Has this anything to do with the future life of the patient? In Dr. Ingersoll's case it seemed almost like acute Hodgkin's disease

by the way that it came up so quickly. Equally quickly it disappeared again, so that it seemed quite unlikely to lead to metastasis such as occurred.

Dr. Coakley objected to calling that growth carcinoma which Dr. Freer had treated. The important facts are that it was a newgrowth, seemed to be carcinoma, was treated and got well.

Dr. Lewis said something about making application to the severe cases (did I understand correctly?) and dealing surgically with the milder ones? I should feel the other way. The earlier I could get an epithelioma of the larynx and expose it to radium before the process was thoroughly organized the better, just exactly as you would concerning surgical procedures. Dr. Crossin gave me great encouragement this morning in regard (I cannot remember who talked in the morning) to the effect of radium on papillomata. A papilloma is an epitheliomatous growth. If it will work with them, why not with cancer?

The chance of adding to our knowledge as we go along is the thing that we should all take to heart. As Dr. Winslow suggested, this matter is new. It is a tremendous subject. Its possibilities are enormous. With the *x*-ray, skin lesions of low grade, epitheliomatous degenerations, when exposed, seem almost to melt away and clear up overnight. They have not had a chance to get into the glands and the process is young.

If the experience of all of us in this radiant emanation matter, as Dr. Winslow says, is kept track of and properly correlated, then we shall get an intelligent view, such as now is not possible.

Dr. Arthur W. Watson, Philadelphia:

It may be of interest to the Association to know that the patient whom I reported a few years ago as having been treated by radium, a case of carcinoma of the larynx, is still living and perfectly well. I have examined him recently.

In relation to the case reported by Dr. Winslow, fibrosarcoma, it has seemed to me a curious thing that in most of the cases of retropharyngeal fibroma that I have seen the pathologist's report on portions of the growth removed has come back fibrosarcoma. Yet recovery has taken place in these cases by means of other than the *x*-ray or radium, either the electrolytic needle or monochloracetic acid, thus proving that they were not sarcoma.

Dr. James E. Logan, Kansas City, Mo.:

I think that the experience of Dr. Winslow in the case of carcinoma

of the larynx, in which he treated it with the external application of radium and the *x*-ray, brings a different aspect to the treatment of these cases. Here we have diminution in size by the use of radium applied in the interior of the larynx; and here Dr. Winslow, with his case of extralaryngeal application, where the radium was applied by accident or otherwise in an overdose, or with too long an exposure of the larynx to radium, had a prolonged ulceration result. Might not that be the proper method of treating these cases rather than by subjecting the patient to the intralaryngeal application of the radium emanation? That is a very interesting phase of this subject, and it might be possible that this is the method to be employed, since his results were so well established.

Dr. Winslow spoke of the pathological findings in these cases. I remember a case of a very large nasal sarcoma that I operated on where there was a speedy recurrence, and I refused to operate on it again because of danger of hemorrhage, from which the patient later died on the table. Dr. Freer said that it was a fibroma, pure and simple; but the pathologist said that it was a distinct case of fibrosarcoma when I operated on it. I take it that this difference in pathological findings might have been due to a difference in the place that the sections were made from. I think that was the reason for the difference between the reports of my pathologist and Dr. Freer's pathologist in Chicago. I refused to reoperate because I thought the patient would die on the table; Dr. Freer operated and the patient did die on the table.

We are never certain of the recovery of these cases. We should watch them carefully throughout their entire life, because they are so liable to have recurrences in other parts of the body. One case that I operated on seemed apparently well for eight years, and autopsy after that revealed a sarcoma of the pancreas. Of course we have all removed these sarcomatous growths by the electrolytic needles and have been successful, without having recurrences; so I take it that we are at least progressing. But recurrences have been prevented by the use of radium, suggesting, as I believe, that the surgical interference in the first place should be followed by the use of radium, or, as suggested by Dr. Smith, the *x*-ray may be used first, then surgery and then radium, which I think is the safest method of procedure.

Dr. Norval H. Pierce, Chicago, Ill.:

I rise to accentuate again my view. I rather antagonize the view that Dr. Coakley put forward in regard to always and invariably

confirming the laryngoscopic diagnosis of cancer of the larynx by microscopic examination. Of course this is a very old and much discussed question, and I believe that it is a dangerous formula to have such extensive credence among laryngologists. I feel rather sensitive on this subject, because I have been rather extensively criticised in Chicago by some of my colleagues for holding the viewpoint that whenever we can escape cutting into a carcinoma of the larynx for microscopic examination we should do so. Now let us look at this case that Dr. Freer reported today, which I saw. Here was a fusiform infiltration of the vocal cord in a man sixty odd years of age. The cord lagged. He was hoarse from January until May. There had been some hoarseness preceding this. Ulceration was very marked when the tumor was touched with peroxide of hydrogen. What could this have been? First we think of carcinoma, then tuberculosis, syphilis, cyst and ordinary low-grade inflammation so called. Against the latter was the fact that this man's larynx was entirely healthy with the exception of the growth on the vocal cord. There were no other infiltrations and no other thickenings. I do not believe that such a laryngoscopic picture occurs as the result of ordinary, simple, chronic inflammation. He was a man that did not use his voice excessively. There was no accident at the beginning of the history. There was no reason for believing that it was simple inflammation. He showed no other evidences. He had never shown any evidences of tuberculosis. There were no tubercle bacilli in his sputum. It could hardly have been tuberculosis. It could not have been syphilis. He had three or four Wassermanns made. He never had had a history of syphilis. He was rather a moderate person in his habits. His spinal fluid had been examined and was negative to Wassermann. He had received vigorous antisyphilitic treatment. Now suppose we had cut into this man's vocal cord to obtain a specimen for microscopic examination. The voice would have been permanently impaired. Fully a third of the cord would have been destroyed. That would have been the only way that we could have done it, because it was an intramural affair. You could not have taken it from the surface but must have gone into the substance of the cord. You must have taken a large piece, not a small piece, to make a diagnosis. Then the picture or prognosis is entirely changed. At best he would have had an area of ulceration under radium with an injured voice. As it is, Freer tells us, the patient's voice is excellent and the tumor has disappeared. If radium will cure tumors of this character, to my thinking, the time has arrived for us to modify the old dictum that we must invariably first confirm our diagnosis of malignancy by microscopic examination before resorting to treatment.

DR. COAKLEY:

May I say a word more, Mr. President? Two or three times a year it happens that cases are referred to me for an opinion in which other men, whose opinions I regard as most valuable, have made a diagnosis of carcinoma of the larynx. I invariably, in these cases, remove a section if I am not frankly able to confirm that diagnosis. If I find the pathological report not satisfactory, as it may not be, I take a second piece before I am willing to submit that patient to the operative procedure advised by previous surgeons.

Recently a patient came to me who had been advised by two competent surgeons in New York to have his larynx completely removed. I do not believe a pathological investigation was even suggested. He had a regular ulcer of the posterior portion of the larynx with moderate impairment of motion at the arytenoid articulation. It did not look like cancer. I removed it and the patient is well today. I saw him a couple of months ago. The family physician of this man was ready to have him subjected to total laryngectomy. He was a man of forty-five, wealthy, and with every reason to live. He is now well with nothing but a slight hoarseness. If you are going to carry out Dr. Pierce's idea you must not put anything in the larynx, such as a swab, which is going to bruise it. I do not believe that Dr. Freer has a technic by which he can remove the larynx without bruising it and squeezing the epithelial cells. Nor must we put radium in, because we are bruising the larynx by this procedure also. I do feel that it is not wise to subject a patient to a serious operation without being sure of your diagnosis. As a matter of fact there is one case that I should like to speak of. The patient was a man in whose case the clinical diagnosis of malignant tumor of the larynx was confirmed by section. He was sent to Baltimore, to Dr. Kelly's sanatorium. The man was radiumized so extensively that he had some sort of burns which lasted more than a year. A year later there was an apparent enlargement of the mass. I took a second section to the pathologist, who again reported that it was epithelioma. More radium was applied. The mass gradually got smaller, and the patient, three or four years afterward, developed such an extensive ulceration from radium burns that it finally exposed the whole of his trachea. He developed bronchiectasis and abscess of the lung and died. He gave permission to take out his larynx after death. Dr. Wood made four thousand sections through the cord. He found not a bit of evidence of epitheliomatous degeneration in the larynx or the surrounding tissue. Evidently radium had destroyed all epitheliomatous masses in spite

of the fact that he had had a section taken out. No man should have a section removed unless he is willing to go on with the surgical treatment necessary in the case.

Dr. Henry H. Forbes, New York City:

I wish to thank my friend Dr. Mosher for this opportunity to appear before your society, and after hearing the very timely and interesting papers on radium, I feel rather in the position of absorption than one of emanation. Radium is not new to me, for it must be some fifteen years ago that Dr. Harris and I had an opportunity to use the radium salt in a few cases of papilloma of the larynx. Lately in the New York Post-graduate Hospital we have tried what I will call team work. Thus Dr. Willis, of the radium department, has been in control of the radium technic, that is quantity, quality and frequency; but what is of interest to you is the fact that all applications and local examinations have been made by a member of the department of diseases of the nose and throat. Thus direct laryngoscopy and esophagoscopy have been of scientific aid in the work we have undertaken. While I now feel quite familiar with the methods of application of both salt and emanations, I do not feel yet in a position to give a scientific opinion on the relative value of the use of the salt or the emanations.

With Dr. Coakley I feel it very desirable to remove a specimen for diagnosis, and I have not thought that this was dangerous to the patient if radium was used before or even at the time. The aim of our work at the hospital, and I believe the aim of the members of this and other scientific bodies of medical men, should be to determine first the value of radium in cancer and the method of application giving the best results, the radium expert working with heads of the various specialties. Since hearing others report their work and results with radium I feel less pessimistic and shall go back to my work encouraged to carry on. Certainly I do feel justified in continuing our work and not to stop it.

There are a few points which I might recite as occurring in our work. At first we used the so-called tubes or capsules in our esophageal and laryngeal cases, later the needles only; now we are using both, selecting the cases. At present we have not a laboratory equipped to make the "emanation seeds." Whether we shall come to the use of the seeds and give up the use of the radium salt, time alone will tell. However, I am impressed by the fact that those who are using the emanation seem to be getting better general results than we are with the use of the salt.

Another point is that we felt when an abscess formed in using the needles that we had perhaps been at fault in our technic; however, at present, I do not feel that this is true, for I have read reports (Beck) of a number of cases of malignant growths which have broken down and abscesses have formed where radium had not been used in any form. If there is an objection to using the needle the same objection would hold good in implanting the seeds, where infection might be quite as likely to follow. To avoid this a thoroughly aseptic method to protect the patient must be used, alcohol or tincture of iodin may be painted over the growth before using the needles.

The question of screening was mentioned by one of the speakers. I do not feel that the gentlemen have emphasized it sufficiently; and while I have only an opinion to offer, I do not think that with an element as active as radium we should expose normal tissue to it yet. I cannot feel, in my own mind, that radium is going in there to act simply on the abnormal tissue and not to act to a certain degree on the normal tissue. I think that the reaction is going to be on the normal tissue also. Some of my friends in New York are already delving into this question. I do feel that a proper screening is necessary, and that in preference to using the capsule, and the use of the emanation in seeds or what we are using, the needle would be a better technic than the method of exposing the entire surrounding tissue, as will be done in using the capsule with no protection to normal tissue—for example, disease of one cord.

Another point that I have found in our work is this: Unfortunately the cases that we have had have not been of the type that Dr. Freer spoke of in reporting his case of apparent cure in the larynx. I do feel from the advanced cases that have come to us, among which we have had a number of deaths, that if I were to see these cases over again I would not expose them to the radium treatment. Dr. Willis believes that in a number of these cases there are certain conditions in other parts of the body or in the blood (of which I cannot give you any data at present), and in these cases radium seems to do harm rather than good.

Regarding the esophageal cases my experience is the same as that of the writer of the paper on esophageal growths. Many of our patients have died of hemorrhage; how we are going to overcome this I do not know. I do not feel that it was of necessity a part of the radium reaction.

Dr. Robert Clyde Lynch, New Orleans, La.:

I want to add my theory to that of Dr. Greene. I have had seven cases, of which four have died. They were treated by the use of needles. I have only 25 mg. of radium in needles. The needles were planted right into the growth and left for four, six, eight and twelve hours at a time. We made the patients more uncomfortable by this procedure instead of giving them analgesia. They suffered more intensely than if they had been let alone, and I believe that they died sooner than they otherwise would have.

Concerning Dr. Smith's remark, I reported a case two or three years ago, in which I did laryngectomy after a previous application of radium; the cuts showed what looked like cartilaginous tissue. There was tremendous sloughing of the parts and the man died from the sloughing process.

If operation is decided on the time for the application of radium is after the operation rather than before on that account.

I want to ask Dr. Freer whether the radium seeds that he used contain 400 mc. of radium? Those of Dr. Greene contained only 4 or 5 mc. Dr. Freer's results were so different from those that I have been able to see in the cases of the men who have been using radium in my section of the country, and in the reports from other sections, that I was wondering whether the tremendous difference in the content of the element used accounted for his results as compared with ours. In my section of the country we are disposed to be a little pessimistic about the results of radium around the mouth and upper esophagus. Our results not only in my own hands but also in those of Matas and Miller, and those who had had considerable experience in operative work in the mouth and throat, and, in a general way, they are disposed to be pessimistic about the results obtained in the mouth, pharynx and upper esophagus. I came back from Boston last year buoyed up, thinking that I was going to do something with esophageal cases, but this knocked me down again. I do not think that we should quit, but that we should go on and work hard and see whether something cannot be done to reduce this 100 per cent mortality. There is no reason why if we report our failures it should not be an incentive to work harder and see whether we cannot get a better result, after all.

Dr. Greene (closing):

I wish to call attention to the fact that I did not claim in my paper to have cured any patients, but that they had been relieved. The method has been palliative in the majority of cases. With seed

implantations one gets necrosis of the part of the tumor which presents in the lumen. The patients have reported as being more comfortable and swallowing better. The end-results have, however, been bad in all but one case. Nevertheless, I think that the method gives some promise of accomplishing more, so I intend to continue its use, hoping to gain increasing effectiveness by combining its use with that of Dr. Duane's new *x*-ray apparatus, which promises to be more effective than anything yet produced in that line. In regard to Dr. Freer's apparatus, I feel that in the face of the results that he has reported, if he continues to get such results, we must acknowledge that he has made a great advance in the application of radiation within the larynx. Our experience at the Huntington Hospital has not been like his. We have had some good results from radiation, and I expect to show next week in Boston two cases of apparent cure of cancer of the larynx by radiation. In one case one and a half years and in the other two years have elapsed since the procedure was undertaken. Our results following the method of surface application of the radium to the larynx have not been as successful as Dr. Freer's. We have not had such an ingenious method of application as he has produced, and I wish to pay tribute to his ingenuity and skill in administering radium in this way. I have found almost always a considerable amount of inflammatory reaction following the application of radium in the larynx—so much so that I have performed a routine preliminary tracheotomy. This does no harm and is the only way to forestall a severe dyspnea which may come on during the period of reaction.

Dr. Winslow (closing):

Regarding the point of preliminary tracheotomy that Dr. Coakley brought up, I would say that in this case it did no harm and healed immediately. I am familiar with peroral intubation both with the rubber catheter and the apparatus of Kuhn, but circumstances alter cases. This was done in a general hospital where I did not have my trained assistants and anesthetist, so I thought it wise to play safe.

The important point in these cases is diagnosis. For that, unless exceptionally, we are rather dependent upon the pathologist. In the second case, to make sure, I resorted to three pathologists, and none of them agreed. The last examination was made of an alcoholic specimen some two years after the operation. It is possible that by maceration the appearances were altered in some way, so that what was originally a round-celled sarcoma gave the appearance of a spindle-celled sarcoma or fibrosarcoma. I do not know whether that

was possible or not. Both slides were reviewed, one by Dr. Burnam, who has daily experience with malignant growths, who passed it as malignant; so I had no hesitation in accepting it as such. The laryngeal case that I reported could have been treated by any method. It was an enormous growth. It happened that at that time the more recent methods were not known. The burn was due to inexperience, as it was one of the first cases of laryngeal tumor treated in this institution. I think that by adequate screening the same dose could have been administered without damage, but the case is a cure.

As to the dose of emanation, I cannot understand it. It seems to me that Dr. Freer's doses are enormous. I am not responsible for the physical side of the preparation. The tubes given me were represented as emanations of pure gamma rays and were certainly very active. Whether there is any difference between mixed rays and pure ones, or how they get the gamma rays isolated, I do not know.

Dr. Lewis (closing):

Relative to the length of time that the patients are able to retain these applications in the larynx, I might say that we used preliminary tracheotomy in our cases because we found that the reaction was so severe that tracheotomy had to be done later any way, and there was an added advantage in putting the larynx at rest. Dr. Swain stated that he would prefer to use radium in early cases of carcinoma of the larynx. I feel differently, because in cases treated by radium there are so few cures; whereas in thyroidotomy about 75 to 80 per cent of cures are obtained when the cases are seen early.

Regarding biopsy, I feel that there are borderline cases in which it is necessary to remove a specimen. In the case of an old man that I saw six months ago, in which I asked Dr. Jackson to coöperate, there was a small ulcerated growth of a few months' duration on the vocal cord. His Wassermann and other examinations were negative. Through the laryngoscope I removed the growth *in toto*, and histological examination of the growth showed it to be simply a papilloma with an ulcerated surface.

THE EARLY STAGES OF HYPERPLASTIC ETHMOIDITIS (LARVAL ETHMOIDITIS)

(*Candidate's Thesis.*)

SAMUEL MC CULLAGH, M.D.

The onset of this disease is so gradual and insidious, and its symptomatology is so slight and indefinite, that in the history-taking of a fully developed case it is generally difficult or impossible to assign a definite date of onset.

While it may be impossible to demonstrate these cases beyond controversy in their incipiency, the existence of beginning changes in this region can be assumed with a degree of assurance amounting almost to certainty in selected cases.

The answer to the question, "When is ethmoiditis?" has never been clear-cut. In what group of symptoms and at what period of their development is the term ethmoiditis justified? It is difficult to conceive of any acute or chronic affection of the nasal mucosa which is not reflected, duplicated or exaggerated in the lining of these cells. The fact that this disease is practically always an associated one, and that it may be overshadowed by the accompanying condition, whether extra- or intranasal; that it may be checked at any stage of its development, though retaining its potentialities for mischief, and that in the ordinary course of events its symptoms may be only of the annoying variety, may explain why its presence in the early stages has been so consistently overlooked or disregarded. Many times the skein of association is so tangled that "the accidental is mistaken for the essential, the responsive for the initiatory, coexistence for causation, the sign for the thing signified."

Skillern,[1] says that "If no signs of purulent secretion or crusts

[1] Accessory Sinuses of the Nose, p. 332.

be present, yet polypoid degeneration of the ethmoid mucosa apparent, we can safely make a diagnosis of chronic hyperplastic ethmoiditis," and "No conservative treatment will suffice after the development of this disease." Previously in discussing the etiology (p. 326) he has described the causative factor as rather depending upon a protracted and more or less continual disturbance in the nutrition of the ethmoid capsule than inflammatory changes with bacterial invasion.

The profession looks to the specialist for a proper classification and definition of the ills that fall within his realm. It will scoff at ultrarefinement of classification, but failure to identify the early stages of a chronic condition cannot but be a reproach to diagnostic skill. As H. C. Wells aptly says: "There is a natural tendency in the human mind to exaggerate the differences and resemblances upon which classifications are based—to suppose that things called by different names are altogether different and that things called by the same names are practically identical."

Changes in the mucosa lining of the ethmoid cells may be arrested at any stage between congestion and polypoid degeneration. The mucosa never becomes absolutely normal and the potentiality of development to maturity ever remains present. It is impossible to predict the course these cases will take without prolonged observation. Hence the term *larval ethmoiditis* is suggested to include all the cases in which change is suspected but cannot be clinically demonstrated. By such a diagnosis recognition is given the fact that either under conditions existent, whose influence cannot be instantly determined or conditions unforeseen that may later supervene, frank hyperplastic ethmoiditis with polypoid change may develop.

To await the development of polypi before making a diagnosis of this condition is to err on the side of ultraconservatism. To diagnose the condition in every case in which changes in the ethmoid mucosa are suspected might prove confusing for clinical purposes, though E. R. Faulkner (private communication) says that at least 75 per cent of the cadavers examined by him show recognizable gross pathological changes.

Until very recently ethmoiditis has been regarded as a disease almost exclusively confined to adult life. A casual examination

of the most recent works on pediatrics convinces one that the conception is still prevalent. The careful and painstaking work of Dean[2] has been most convincing in the correction of this error. While his investigations have dealt mainly with the suppurative type of the disease the field opened up for speculation is very broad.

In one series of 234 children with adenoids, thirteen years of age or younger, he proved microbic infection in 15 per cent. In a second series of 145 cases, 65, almost 45 per cent, were infected. It is fair to assume that practically every child in both these series would have shown inflammatory changes in the ethmoid mucosa. Of the sinuses he finds the ethmoids most frequently involved. He also states[3] that "when sinus diseases have been apparently cured the cure may be more apparent than real."

The ethmoid cells, according to Schaeffer,[4] "develop by the evagination of pits in the nasal mucous membrane of the fetus with consequent pneumatization of the primitively solid structures of the lateral masses." Subject as the nasal mucosa is to the insults of various irritants— microbic, chemical and mechanical—it must be that, in many infants, that portion lining these primitive parts is diseased before pneumatization has much more than started, and as a consequence the lining of these cells—the evaginating membrane—has always been diseased.

The mechanical difficulties inherent in the examination of the ethmoid region of an infant or young child will always force dependence upon the history in making a diagnosis. The *x*-ray cannot be relied upon implicitly and its value is largely of a confirmatory nature.

The frequency of larval types of ethmoiditis will be better appreciated with this revised conception of the age at which this disease may commence. Dean states that the cures of the suppurative type are in some cases more apparent than real, which warning is echoed by Coffin,[5] who says: "There is no security

[2] Nasal Sinus Diseases in Infants and Young Children, Tr. Am. Laryngol., Rhinol. and Otol. Association, 1919.

[3] Paranasal Sinus Diseases in Children, University of Iowa Studies in Medicine.

[4] The Nose and Olfactory Tract.

[5] Discussion, Tr. Am. Laryngol., Rhinol. and Otol. Association, 1921, p. 22.

against recurrence in the ethmoid. You do not know when these cases are well." The fact that a diseased membrane is less resistant to infection than a healthy one causes the transfer of many of these cases at some stage of their development from the hyperplastic to the suppurative type. That the full florescence of the disease may be rapid is established by the fact that two children, aged five and six years respectively, came under observation during the past winter with nasal polypi, and a radical operation was necessary upon two boys, aged fourteen and fifteen years, for complete bilateral occlusion due to polypi.

For clinical purposes the etiological factors of hyperplastic ethmoiditis might be roughly divided into intra- and extranasal, though at times both factors may be active. In both types the original cause may have disappeared or become so ameliorated as to be unrecognizable. Yet profound changes may remain in the ethmoids.

The intranasal causes, such as anatomical irregularities, repeated local infections, etc., are so well recognized as etiological factors as to demand but passing mention. The tendency to disregard the ultimate possibility of the long-continued action of a mild irritant, mechanical or chemical, must be combated and close watch kept to prevent the development of a condition in which "no conservative treatment will suffice."

The exact etiological value to give to certain extranasal factors is problematical. The realm of speculation is entered, but the challenging of theories, later perhaps to be proved false, focuses attention and often leads to the closer observation that reveals the truth or prevents causation being mistaken for coexistence.

That disturbances of the gastro-intestinal tract and the endocrine glands, as well as protein sensitization, to mention a few of the important groups, are reflected in the nasal passages, has long been recognized, but the surface of the subject has but been scratched.

The suggestive work of L. A. Coffin has been generally disregarded, and he has not pushed his studies in the field. There are three conditions of etiological significance in this tract: putrefactive toxemia, metabolic toxemia and protein sensitization. In the more advanced cases of hyperplastic ethmoiditis, with this underlying or accompanying condition, local treatments and

surgical measures will never afford proper relief until the gut receives proper attention. A Eustis[6] in a series of 158 asthma patients found indicanuria in 98.3 per cent. J. C. Beck[7] claims that hyperplastic ethmoiditis is due to hyposecretion or disharmony of one or more of the ductless glands, that the underlying cause is a focal infection and that the source thereof is most frequently in the intestinal tract.

The vast amount of clinical interest and laboratory research now going on in the field of endocrinology is bound to eventuate in a crystallization at least of the basic truths regarding these important glands and a better knowledge of their interrelationship.

The association of endocrine disfunction and hyperplastic ethmoiditis is fairly common. Whether the solution propounded by Beck is the true one, time and a more careful and extended observation will prove. There are probably other factors concerned also. Cases have been observed in which such association was not demonstrable. In some of those suffering from hyperthyroidism it may have been that an acute or subacute sinus infection may have been the cause of the derangement of the normal thyroid function. Though the microbic element had disappeared enough irritation remained to continue the condition. These cases of lowgrade hyperthyroidism are easy to overlook, as the symptoms are vague, yet localized enough to direct the patient to seek relief from the rhinologist.

J. C. Beck,[8] says that "the pathological changes found in the middle turbinates and curetted portions of the ethmoid in asthma cases and in the suppurative sinusitis are very striking in that the bone shows rarefaction somewhat resembling that found in early bony changes of osteomalacia, acromegalia and otosclerosis. This pathological finding is suggestive of a possible etiological factor in some disturbances of the polyglandular system or the glands of internal secretion."

Selfridge[9] claims that the endocrine glands are the probable fundamental source of vasomotor instability and cites cases due to hyperthyroidism and disfunction of other glands.

[6] Quoted by E. Zueblin, New York Med. Jour., 1918, x, 51.
[7] The Laryngoscope, 1917, p. 425.
[8] Tr. Am. Laryngol., Rhinol. and Otol. Association, 1913, p. 71.
[9] California State Jour. Med., April-May, 1919.

The more violent types of protein sensitization with nasal response are not in as much danger of being undiagnosed as the very mild cases in which the persistent action of slight irritation leads to chronic changes before the source is discovered.

Of the complications of this disease, eye affections and asthma are preëminent. Neither the rhinologist nor the ophthalmologist has yet realized the full extent of the role of non-suppurative ethmoid disease in the former class. For example, a hypothesis to explain the sequence of events in certain cases of retrobulbar neuritis is very difficult to formulate. The history, the examination, the *x*-ray and the operative and pathological findings may all be practically negative in cases with sudden loss of vision, and yet the postoperative result may be brilliant. Though operative measures of such severity, based upon a diagnosis by exclusion, are not relished by a conscientious surgeon, the gravity of the condition demands such procedure until more accurate diagnostic measures have been attained.

The assumption seems justified that if such a severe and inexplicable complication may ensue other conditions of less gravity must be influenced by the apparently slight changes in the ethmoid cells, which may retard or prevent proper response to therapeutic measures. The adoption of the attitude, "Guilty until proved innocent," rather than its converse, might prove of inestimable value.

The treatment of the early stage of hyperplastic ethmoiditis calls for no extensive comment. Once the liability of the development of this condition is fully appreciated the prophylactic treatment becomes self-evident. Brilliant or striking results are not to be anticipated and the attempt to restore cells to normalcy will often appear as difficult as the restoration of the world to the same much-to-be-desired condition. Persistence and the ability to shift the point of attack as conditions change promise most.

For direct local action the apparatus devised by Coffin for alternate suction and compression, supplemented by the nasal siphon, sold under the name of Nichols, or the so-called Brawley suction apparatus for home use, has yielded fair results. Though complete cure will not result in all cases, careful prophylaxis will greatly diminish the number that develop to maturity or become suppurative and force the condition to remain in the larval state.

WAR SURGERY OF THE LARYNX, WITH SPECIAL REFERENCE TO THE WORK AT CAPE MAY

(*Candidate's Thesis.*)

GORDON BERRY, M.D.

This paper purposes to discuss war surgery of the larynx, first reviewing hurriedly the fairly abundant literature, then taking up in turn the twelve laryngeal cases treated by the writer at Cape May, and finally pointing out some of the lessons which this experience has taught.

In calling this subject to your attention I am not unmindful of the very important part this Association played, both collectively and individually, in the recent struggle. It was your committee, appointed in the first days of the war, who met with others and were instrumental in formulating a plan the fruition of which was the forming of U. S. General Hospital No. 11 at Cape May, N. J., for the exclusive treatment of head injuries and diseases; and it was to two of your members in Washington, Colonel Mosher and Colonel Richardson, each of whom rendered such signal service in his respective field of endeavor, to whom the writer was immediately responsible, and who so aided him with wise counsel and encouragement. Dr. Jackson made a special trip to Cape May, where his kindly and careful advice was of great assistance. In the more recent work with the stenosed conditions the writer has drawn freely on Dr. Lynah's rich experience and has found him never too busy to lend a helping hand. Finally, it was Colonel Ingersoll, our chief during the first eight months of my service, whose faith gave courage to continue in this discouraging work.

In reviewing the literature on this subject the writer has gone over the English, French, German and Austrian journals during the last five years and finds a wealth of material, but of a rather

heterogeneous nature. The most of the articles deal with acute and recent cases. Subsequently, writers like Harmer[16] have compiled the statistics available and drawn conclusions, and Moure[33] has written his book on the subject. Now, as the smoke of battle clears away, the scattered cases are gravitating to the larger centers like London, Berlin, Paris and Bordeaux, and we shall hear reports of those that have done less well and need further care. It is in this type of case that this paper particularly deals.

Numbers Reported. In the American Civil War (according to Allenbach[35]), 235,585 were injured, of which 82, or 0.035 per cent, had laryngeal wounds; in the Franco-German war of 1870–71, 99,556 were injured, with 65, or 0.06 per cent, laryngeal wounds. Oertel[48] gives about the same figures for the Balkan War. In the World War many more laryngeal cases are reported and the available percentages are higher. One author (Allenbach[35]) reviews thirty publications, finding 110 cases—of which Koerner gave 16, Killian 22, Scherer 7—out of 2500 wounded (or 0.28 per cent.) Lannois, Sargnon and Dauriac[30] report on 57 cases, Boehler[1] discusses 9 acute cases, Koerner[46] gives detailed findings in 33 cases and von Meurers[51] gives 18 cases. Harmer[16] writes more recently of 245 cases which he had observed, or investigated through the English hospitals and by writing to eighty laryngologists. Bruening[37] gives 6 cases and Kofler and Fruehwald[44] review 21 cases from the Vienna Clinic. Oertel[48] discusses Thost's 11 cases and odd cases from Kohler, von Kofemann, Bleyl, Auersbach and Zange; while the following men report one or two cases each in the English journals: Stuart-Low,[22] Tod,[14] Syme,[23] Peters[21], Davis,[11] O'Malley,[17] Hill, [17 18] St. Clair Thomson,[25] French,[14] Milligan,[20] In the French periodicals we find reports of cases by Canuyt,[26 27] Guyot,[29] Guisez[28] and Moure.[31 32]

Nature of the Injury. Not only is the larynx difficult to hit, but when hit such injury usually proves fatal. A shot from in front, the most dangerous according to Moure, is likely to shatter the spinal cord; or a tearing shell fragment may cut one of the great vessels (von Meurers,[51] Harmer[46]). The number surviving long enough to reach medical care is thus small. In one series (Kofler and Fruehwald[44]) of injuries to the upper respiratory passages

25 per cent involved the larynx and 1½ per cent the trachea. The commonest place of entry was the anterior triangle of the neck. Transverse wounds were more common than oblique. A bullet may dissect its way between the important structures of the neck and do them but temporary harm. The wound of entrance is usually small, that of exit large and jagged, and the damage to the cartilaginous structures may be much worse than the external wound would suggest. Subglottic wounds appeared to be the most serious. Tracheal injuries were rare. The pharynx and esophagus were often included. Perforating wounds were more common and less dangerous than penetrating. In Harmer's[15] series of 108 cases the injury was caused by bullets in 58, by shrapnel in 20, by shell fragments in 6 and by bayonet in 1. Allenbach[35] found 80 per cent of war laryngeal injuries to be due to gunshot wounds. The least harmful missile (Oertel[48]) was a perforating bullet at from 100 to 500 meters' range. Investigations in our army showed that in early flight the centrifugal action of the bullet had not become entirely effective, while toward the end of the flight this action was not strong enough to keep the bullet in true alignment; hence the least damage if striking while in midflight.

Symptoms. The principal symptoms given are aphonia, hemoptysis, dyspnea, external hemorrhage, dysphagia, emphysema, difficulty in moving the neck and injuries to the neighboring nerves. The more frequent complications are bronchitis, pneumonia, septicemia, mediastinitis and gas infection.

Diagnosis. The diagnosis can be in little doubt. The appearance of the patient may be dramatic. The sudden loss of voice, the spitting of blood, the blowing of air and the sucking of blood through the wound would try the courage of the most seasoned soldier.

Treatment. The treatment depends upon the nature and severity of the lesion and may be divided into palliative and radical. The first depends upon rest, sedatives, steam inhalations and allied medication. Many cases were cured in this way. The first need is to prevent choking. If palliative measures do not serve a tracheotomy becomes imperative. This can be delayed longer if the case is under close hospital observation; while if it is to be transported, in case of doubt an initial tracheotomy is advisable.

Harmer[15] and Allenbach[34] found that about one-third of all the cases required tracheotomy. The point of election of this operation is somewhat in dispute, though all agree that if the condition is urgent the quickest route is the best. Moure[33] tries to go through the wound if haste is called for. If he has time he prefers to enter at a distance from the wound, thus keeping away from the sepsis and subsequent perichondritis. All advise against going between the cricoid and thyroid. The thyrohyoid membrane makes a poor entrance, as the epiglottis is in the way. Preference is given for two routes—the high and the low tracheotomy: the high entering at or near the second tracheal ring, where the trachea lies superficially and can be more readily entered; the low entering through the third to the fifth tracheal ring. Since the trachea becomes more deeply situated as it passes down the neck, the lower the tracheotomy the harder; also the more danger of infection or emphysema entering the mediastinum. The high entrance lends itself to retrograde bougienage or the anchoring of dilating intubation tubes. The low is more remote from the infection of the laryngeal wound and removes further the irritating cannula. The majority of the writers prefer the high tracheotomy first, and a low one later should the cannula have to remain in for a long time.

Bleeding may be severe. If a great vessel has been severed death usually comes before proper aid can be secured. There are two other forms of bleeding to be considered: extralaryngeal, which is controlled by the usual surgical procedures, and intralaryngeal. The latter may be in the mucous membrane or in the cartilage. The intralaryngeal bleeding usually stops of itself, but von Meurers[51] had two cases that failed to do so. He did a prompt laryngofissure, picked out the fractured pieces of cartilage and sutured the torn mucous membrane, controlling capillary hemorrhage by pressure and a styptic. He packed the wound open ten and thirty-four days respectively, then sutured the thyroid together over a temporary intubation tube. This and the tracheotomy tube were soon removed, with resulting good breathing but a continued husky voice.

The emphysema takes care of itself after free breathing has been obtained and the wound is opened up—unless the mediastinum is involved, when the prognosis is grave. Killian found emphy-

sema and dyspnea more frequent in subglottic injuries, von Meurers[51] found more where the lower pharynx was wounded. Dysphagia when due to traumatic swelling disappears as the edema goes down. If, however, the esophagus has been cut the edges should be sutured and the patient fed for a while through a tube or by rectum.

Injury to the nerves of the neck may be direct or indirect. Koerner[46] noted a bilateral recurrent laryngeal paralysis from indirect trauma. The missile struck the larynx a glancing blow, injuring neither the larynx nor the nerves. The paralysis disappeared. Individual branches of the superior or inferior laryngeal nerves may be injured or the missile may paralyze the ninth, tenth, eleventh and twelfth nerves on one side, singly or all together. Koerner[45] reports a case in which the vagus, spinal accessory and hypoglossal were not directly injured but were caught in a scar with consequent paralysis. By neurolysis he was able to free these nerves with a later partial return of function, the only case he knew of where such an attempt had been successful.

Any portion of the laryngeal structure may be selected by the injuring missile. The cricoid alone is rarely fractured. Either thyroid plate may be comminuted. The cricoarytenoid articulation may be disturbed, with later ankylosis. A section of vocal cord may be punched out. The muscles may be injured or paralyzed, singly or in groups. Of these the cricothyroid is frequently hurt; the cricoarytenoideus posticus and the arytenoideus very rarely because of their deep situation.

The indirect laryngeal picture should be studied as early as possible. In this way tears of the mucous membrane, edematous stenoses, and early paralyses may be determined and recorded against later change. Much help and instruction can be gained from such frequent observations.

Most of the cases show early stenoses. These are due to local inflammation, or edema, or a hematoma, or an abscess. They may be due to an arytenoid ankylosis or to a bilateral abductor paralysis. Many of these cases, though seeming to need a tracheotomy, will quiet down under sedatives, inhalations and rest. When necessary a high temporary tracheotomy is done. In almost

all of the cases reported the stenosis soon disappears enough to permit peroral breathing, and the cannula is removed in a few days, the wound promptly closing itself. In those acute cases the prognosis is favorable though a complete functional cure is rare. Good breathing returns in all, but most of the writers note a hoarseness or an easy tiring of the voice, which continues. This may be due to partial loss of a vocal cord or to a unilateral ankylosis or to a one-sided paralysis. In such cases the other side develops a compensatory action which is sufficient for ordinary use. The time before these acute cases clear and compensation is established varies, according to the severity of the lesion, from one week to a few months.

Chronic Forms. Passing thus cursorily over the acute forms we come to a discussion of the chronic cases. Moure, Liebault and Canuyt in their notable work on *War Pathology of the Larynx and Trachea*[33] go most extensively into the subject. Harmer,[15 16] Lannois,[30] von Meurers,[51] Allenbach,[35] Oertel,[48] Kofler,[44] and Bruenings[37] give exhaustive discussions in the foreign literature. Let us pass first, however, to a careful review of the twelve laryngeal cases at Cape May. Since probably a great proportion of all the chronic severe laryngeal cases came to Cape May, it would seem that the number of laryngeal injuries in the American Army was small. Because they represent most of the varieties discussed in the European literature, and because relatively little appears in our own journals concerning these war injuries of the larynx, the writer is encouraged to make our twelve cases a matter of careful record and to go into greater detail than would be otherwise fitting. In a "comment" after each case the salient points are discussed. The more trying cases are entered first.

Case I. *Diagnosis.* Gunshot wound of the larynx. Perichondritis with fistula. Stenosis. Laryngofissure. A chronic tracheotomy case.

History. Pvt. L. M. was taking back some prisoners he had captured in the St. Mihiel Sector on September 14, 1918, when pieces of shrapnel from an overhead exploding shell entered his neck and fractured his right forearm. Loss of voice and bleeding from the mouth followed at once. He made his prisoners give him emergency treatment. The missile entered the neck on the left at the upper border

of the thyroid and came out a little lower down anterior to the sternomastoid muscle. Eight hours later an operation cleaned up the wound of exit, but was unable to recover a small metallic fragment, which still remains just in front of the right lateral process of the 5th cervical vertebra. This has given him no trouble. Five weeks after the injury the neck became swollen and was incised in the midline, evacuating pus. Two weeks later, while on the transport coming across, breathing became so labored that an emergency high tracheotomy was done. The tube was removed two days after landing. One week later, while on the train for Cape May, respiration again became difficult. He reached us on November 10, 1918.

Examination at this time showed a high tracheotomy wound with a small discharging fistula one-half inch above it, admitting a probe directly into the lumen of the larynx, with some necrosis and loss of cartilage along the path. The other wounds were healed. The laryngeal picture was one of pronounced tumefaction of the ventricular bands, closing the glottis. A little air was being forced through.

Treatment. Steam inhalations and sedatives were of no avail, so a tracheotomy tube was inserted through the old wound, to be lowered later at Dr. Jackson's suggestion. A temporary emphysema followed this latter operation, which quieted in two days. The fistula was curetted and treated periodically. It cleared somewhat but would not heal.

Laryngofissure. On June 18, 1919, seven months after admission, the thyroid cartilage was split open under local anesthesia. The fistulous tract was dissected out. It did not lead to the foreign body. Two or three suggestive raw areas in the membrane were curetted and the edges united with sutures. There was much edema and infiltration of the mucous membrane, particularly around the arytenoids and cords. A soft rubber tube was placed in the glottis, anchored to the tracheotomy tube and the wound carefully sutured over it. Six days later the rubber tube was removed through the tracheotomy wound. The wound was then healed, but broke down later, to discharge three weeks and then heal permanently.

On July 27 a dilating soft rubber tube was inserted from above, anchored to the tracheotomy tube and removed on the ninth day. On September 5 and on October 31 some granulations were removed from below the left vocal cord by direct laryngoscopy. He had been encouraged to periodically close the tracheotomy tube. By November, 1919, he was able to keep the tube plugged all day, and on the fifth the No. 2 tracheotomy tube was removed permanently. The tracheotomy wound closed in twenty-four hours. Breathing was labored during the first two or three nights only.

Result. The patient was discharged on January, 1920, and sent to Worcester for further care, where trichloracetic acid was applied to small granulations on February 27 and the stenosis was dilated on March 6. A mild recurrent tonsillitis kept the throat congested and the tonsils were removed on September 30. No other surgical treatment has been employed. He has been having voice-training lessons under an expert and gradually a husky whisper voice has been getting some tone. The laryngeal picture is one of almost complete paralysis of the remnant of the left vocal cord, with free motility of a rough-edged right. The left arytenoid moves a little. Phonation leaves a chink between the cords at the middle third. There is a lateral mounding firm tissue in the subglottic space which leaves a slit-like vent 2 to 3 mm. broad, similar to that through the glottis. This gives ample respiratory space excepting when he exercises violently. There is also a slight embarrassment at night during a severe cold. Damp, cold weather aggravates the congestion. He is a farmer by trade and has returned to North Carolina to work. He writes that he gets out of breath with heavy farm work. A weak heart is partly responsible for this. It may be necessary to dilate the partial remaining subglottic stenosis a little further, but the writer anticipates that no further treatment will be needed. The voice should improve but will always be husky.

Comment. In this case a perichondritis may be considered the cause of the abscess and of the later acute stenosis, which necessitated a tracheotomy seven weeks after the injury. The perichondritis also prevented the fistula from yielding to eight months of earnest treatment. Only the complete cleaning up of the process in the laryngofissure operation controlled this perichondritis. With the infection out of the way the problem became the uncomplicated one of opening up the fibrous laryngeal stenosis.

Case II. Diagnosis: Gunshot wound of the larynx and trachea. A chronic tracheotomy case.

History. Sgt. A. K. was shot through the neck by a sniper in the Argonne Forest on September 29, 1918. The bullet entered just below the cricoid near the midline, traversed the trachea and deep structures of the right neck and came out behind in the right scapular region, where it made a large ragged wound. It knocked him down momentarily. Then he ran about fifty yards, where stretcher-bearers met him. Several mouthfuls of blood were spat up. There was imme-

diate aphonia and paralysis of the right arm. The patient was hurried back successively to the first aid station, the regimental aid station and a field hospital by stretcher and motor truck. Here, twenty-four hours after the accident, an emergency tracheotomy was done. Thence he went by train to the first base hospital, where his condition became worse. He could not swallow and rectal feedings were necessary for a while. When better he was sent in November to a second base hospital. Three more base hospitals brought him to Brest, where after a week's rest he was transported to New York. Here he stayed varying lengths of time in the debarkation hospital, then in two general hospitals, then at a base hospital. In July, 1919, he was sent to the general hospital at Fox Hills on Staten Island, where our service had been transferred on the closing of the Cape May hospital.

Examination. Patient wearing No. 5 tracheotomy tube, passing in at about the second tracheal ring. Wounds all healed. No discharging perichondritis. The laryngeal picture showed a general swollen appearance of the ventricular bands hiding laryngeal detail. A little air could be forced through. General condition good.

Treatment. First the tracheotomy tube was partially plugged with a rubber cork for a little while each day. In this way a little laryngeal breathing space was gained. On August 29, 1921, the larynx was dilated from above and a soft rubber tube, beveled longer posteriorly and long enough to reach from the tracheotomy tube to just below the vocal cords, was tied to the cannula. This rubber tube was removed nine days later. On September 29 the stenosis was dilated from below and again one week later. By October 10 he could keep the tube plugged tight for half an hour at a time. A smaller tracheotomy tube (No. 3) was now used. On November 6 the anterior subglottidean scar was partly cut with a laryngeal knife and cauterized with trichloracetic acid.

The writer was now discharged from military service. Two months later this patient was sent to Worcester to continue under his care. Here the stenosis was progressively dilated five times. Usually the soft rubber intubation tube was inserted for four to eight days after each dilatation. Then Dr. Lynah kindly pointed out the superior value of cutting the adhesions with the thermocautery. They had proved so tough that little progress was being made. Dr. Lynah's tracheal cautery equipment was obtained and used twice, with pronounced gain.

Result. The patient is now wearing a No. 2 tube. This he corks tight night and day, excepting when he gets a cold. Colds have delayed his progress a great deal.

The laryngeal picture shows some motility of both arytenoids, the left more, which passes part way behind the right. Both cords are rough and show some loss of tissue in the middle third, preventing complete phonation. The left cord moves, the right is almost fixed. Below the cords the space measures almost normal anteroposteriorly (where the fibrous stenosis has been cut), but there is a lateral mounding of fibrous tissue anteriorly. The reaction from the last dilatation six weeks ago has not entirely gone. A speaking voice is present, but is very husky. On a warm day he can play baseball with the tube plugged. It is hoped that the tracheotomy tube can be permanently removed after one more cautery operation.

Comment. The difficulties many of the patients had in transportation is shown in this case, which went to fourteen successive medical units during nine months of travel before constructive work could be successfully begun. The laryngeal stenosis had by then become more firm and fibrous and the cure was in consequence delayed. It was to alleviate this trouble in so far as possible that skilled surgical units were taken up to the fighting line. Had the war lasted longer speedier transportation of these chronic cases to their ultimate hospitals would have been established.

A little of the detail of corking the tracheotomy tube (as Jackson suggests[6]), of progressive dilatation and of cautery of the stenotic bands, is inserted here and in Case III. It may be added that the old fenestrated tube, designed to encourage peroral breathing, has been discarded in our experience in favor of the non-fenestrated tube. A No. 6 or No. 5 is used first. As rapidly as peroral breathing will permit a smaller tube is used. This procedure serves a threefold purpose: it progressively discourages tracheotomy breathing; it permits more room around the tube for peroral breathing; and (very important) the pressure of this passing air discourages the granulations and infiltrated swellings around the tube, particularly above it, which later are so hard to reduce.

Case III. Diagnosis: Gunshot wound of the larynx. Stenosis. Chronic tracheotomy case.

History. Pvt. H. J. C., while in action at Soissons on July 19, 1918, was struck in the neck, right thigh and buttocks by shell fragments. Four days later a high emergency tracheotomy was done and the

patient was still wearing the tube when he reached Cape May on October 24, 1918.

Examination at Cape May. The larynx showed much congested ventricular bands which almost met. The cords were dark red and swollen. The rima glottidis was a mere slit which opened a little on forced expiration. Right arytenoid asymmetrically placed to the side.

Treatment. After two dilatations the patient could plug the tracheotomy tube shut for half an hour at a time on December 16. On February 20 he was able to plug the cannula for an hour and a smaller cannula was inserted (No. 4). In May a dilating soft rubber tube, bent double, after the method of Iglauer, was anchored in the subglottideal stenotic space. One week later this was replaced by a larger straight rubber tube. A still larger one was inserted after five days. These tubes remained in almost a month. On September 21 he could plug the cannula shut for two hours at a stretch. One month later this time lengthened to three hours. Then there was a cold with a temporary setback. As the writer was soon to leave military service an attempt was made on November 5 to permanently remove the tracheotomy tube. Peroral breathing was almost adequate. The cords tended to collapse on inspiration like a double valve. Eleven days later the breathing became too labored, the patient was becoming white from chronic air-hunger and the tracheotomy tube was replaced. With the expulsion of considerable sticky mucus, normal tube-breathing was reëstablished. In January, 1920, the case was put under the writer's care in Worcester. Now followed a successive series of discouraging colds which seemed to undo much of the benefit gained from seven dilating operations similar to those in Case II. At present he is recovering from a cold of two months' duration. The rima glottidis is but a narrow space through which he can breathe while he keeps the cannula plugged shut for perhaps an hour. When the cold is gone the subsiding edema will permit the plugging tight of the tracheotomy tube for a week at a time. The vocal cords are both fairly movable. The stenosis is immediately below. The left arytenoid is fixed.

Comment. This has proved the most stubborn case of the series. Two special phases should be noted: First, these laryngeal cases catch cold easily. During such a cold, laryngeal manipulation is much more difficult and yields no benefit. More than half of the time in this case was spent solely in trying to control his colds. The removal of his tonsils helped a little. There was a diffuse congestion of the mucous membrane of the upper respiratory tract

of a rather passive chronic type. Earnest efforts to find a localized infection as a causative factor yielded nothing. Second, the tracheotomy tube should be left in until the patient can plug it tight under every possible condition without embarrassment. The tube was removed over a year ago in this patient, but had to be reinserted after eleven days of somewhat labored breathing. Now, excepting when he has a cold, he does not need the tube; but it is still too early to remove it.

Note that Case II shows a movable arytenoid with its cord so bound down by scar tissues as to be almost fixed. On the other hand Case III shows an ankylosed arytenoid with its vocal cord movable.

Case IV. Diagnosis: Fracture of the cricoid, with perichondritis and laryngeal stenosis. Chronic tracheotomy case.

History. Pvt. P. H. R. fell 300 feet with his aeroplane. Suffered lacerated wounds of the jaw, the forearm and the leg. Unconscious four hours. Had a little trouble with breathing, but was returned to active flying in three days. Three days later he was sent back to the hospital on account of an increasing difficulty in breathing and an emergency tracheotomy was done (November 27, 1917). One month later he reached Walter Reed Hospital, where Col. Charles H. Richardson diagnosed the fractured cricoid. He noted a marked infiltration of the subglottic mucous membrane, and a glottis so closed as to leave only a minute chink posteriorly through which air could pass. He was transferred to Dr. Jackson's care, who performed a low tracheotomy and inserted a larger tube. Progressive dilatation was done from time to time during the next seven months. The patient was then transferred to Cape May on August 14, 1918.

Examination revealed thickened ventricular bands. The vocal cords were thickened, approximately evenly, but their lateral excursion was small. The subglottic space was almost closed by infiltrated mucous membrane, with a small opening through which a little air could be forced in or out. He was breathing through a low tracheotomy tube.

Treatment. Following Dr. Jackson's suggestion we instituted his "orthopedic treatment," closing off the tracheotomy tube with a rubber cork as much as possible and so encouraging the establishment of a laryngeal passage. At first the tube was partly closed for a few minutes at a time. This time was lengthened and then more of the

lumen of the tube was shut off. Too prolonged closure of the tube resulted in air-hunger. Progress was slow. He remained under this treatment for five months and then was discharged from military service and returned to Dr. Jackson's care, where progressive dilatation and periodic corking of the tube were continued.

Result. Six months later we heard that he was still wearing the tube, but that there was a freer laryngeal passage. Progress in this case was thus slow, but sure. By closing his tracheotomy tube with his finger when talking he could speak with a husky but readily intelligible voice, which did not tire easily.

Comment. The undiscovered cricoid fracture and later perichondritis gave the stenosis a good start. The high tracheotomy, though the proper thing to do at first, furnished an irritant to the infected swollen area, and it was not until the low tracheotomy by Dr. Jackson removed this irritant that the swelling began to go down.

Case V. Diagnosis: Perforating gunshot wound of the larynx, with perichondritis and laryngeal stenosis. Tracheotomy. Laryngofissure. Discharging fistula.

History. Pvt. J. H. was struck by a machine-gun bullet at Cantigny, France, on May 28, 1918. The entrance was in the right carotid region, with exit at about the same level in the left sternomastoid region, the bullet passing through the larynx. An operation was performed the next day. Nothing was done to the wound of entrance; a débridement was done to the wound of exit. The thyroid cartilage showed a compound comminuted fracture. The condition of the wound prevented good coaptation of the cartilage fragments. The larynx was opened and cleaned. The mucous membrane was very edematous, particularly in the region of the ventricular bands and the epiglottis. A high tracheotomy tube was inserted. Two weeks later the sutures had to be removed because of suppuration in the wound. Still one week later the tracheotomy tube was removed, not to be replaced. In the meantime he was transported from station to station, finally reaching Cape May four months after the injury, on September 1, 1918.

Examination at Cape May. Swelling of both ventricular bands; infiltration of interarytenoid mucous membrane; thickening of vocal cords, which, however, were intact and approximated symmetrically. A fistulous tract near the cricoid cartilage discharged a little pus when

the patient swallowed. Not wearing a tube. Spoke in a whisper. General condition good. *X*-ray report negative; no special fracture or peculiarity discernible.

Treatment. The sinus was curetted from time to time and an attempt made to remove any necrotic cartilage along the fistulous tract which passed indirectly into the intralaryngeal space. The wound tended to close on the outside and remain as a discharging open sinus on the inside, breaking down periodically externally. On January 25, 1919, four months after admission, the wound healed and he was discharged on February 7, 1919. At that time the vocal cords still showed marked edema and irregularity. The speech was much better, but still very husky.

Result. A letter from him dated April 29, 1921, says that he reached home without mishap, and then the old fistula broke down and discharged for over a year, when it healed and has remained so. He tried farming, but got out of breath and had to give it up. When he gets heated he chokes. An examining officer tells him he will never be able to do hard work. He is doing nothing now. The voice is stronger, like that of a man with a severe cold.

Comment. The more prompt favorable result in this case was unquestionably due to the early radical clearing up of the lacerated bullet path. Had the case not had to hurry on to the rear the fistulous tract which developed might have been early controlled. The writer should have opened and cleaned up this fistula when the case reached him. Palliative measures seemed to succeed. Instead of the process healing, as was supposed, it simply closed on the outside and continued to drain on the inside. For this reason it broke down after it left us and continued to give trouble for a year, healing of itself finally.

Case VI. Diagnosis: Penetrating gunshot wound of larynx, with perichondritis and discharging fistula. Tracheotomy.

History. Pvt. Z. P. was wounded by two shell fragments in the Somme sector on May 3, 1918. The larger missile passed through the neck and left arm; the smaller was removed from the neck on the next day and a high tracheotomy tube inserted to control the dyspnea. This tube was removed after twenty days and not replaced. He was transferred to this country and admitted at Cape May on November 26, 1918, about six months after the injury.

Examination on admission revealed swollen ventricular bands, with some loss of tissue on the left. This swelling hid the true cords. There was sufficient breathing space. Almost in the median line an external suppurating sinus led to the left, through the left wing of the thyroid cartilage, ending on the inside beneath the thyroarytenoideus muscle and the laryngeal mucous membrane. The *x*-ray showed two small metallic fragments buried in the soft tissue of the right neck. They were doing no harm and were not disturbed.

Treatment. The sinus was curetted and packed open with gauze on November 29, 1918. On January 10, 1919, the sinus had ceased discharging and had healed. Two weeks later the laryngeal examination showed the ventricular bands less swollen, and the vocal cords easily seen. The right was thickened and moved fairly freely; the left cord was irregular, with the posterior portion punched out. What was left showed slight motility. Immediately below the anterior angle of the cords there was visible a slight mounding infiltration of tissue. This was near the site of the former fistula.

Result. He spoke in a loud whisper when he was discharged on February 12, 1919. He did not reply to an inquiry as to the subsequent course of his trouble.

Comment. This case probably did well after his discharge. Though a very similar case to Case V, the effort to curette out the fistula without splitting open the larynx was more strenuously undertaken and met with better success.

Careful *x*-rays and probing the fistula under the fluoroscope showed that the remaining metallic fragments in this patient and in Case I had no connection with the active process. They were left buried in the soft tissues of the neck and their presence apparently had no ill effect.

Case VII. Diagnosis: Paralysis of the right inferior laryngeal nerve from perforating gunshot wound of the neck.

History. Pvt. J. H. B. was wounded on October 18, 1918, while in action on the Verdun front. The bullet entered the right axilla, out at the right shoulder, in again low in the right neck, passing behind the trachea and the larynx and out at the level of the cricoid on the left side of the neck, injuring in transit the right inferior laryngeal nerve.

Examination at Cape May three months later revealed a tense immobile right vocal cord situated a little external to the median line.

The right arytenoid seemed ankylosed. Phonation was obtained by overapproximation of the opposite cord.

Treatment. Under electrical stimulation and voice-training for a month the right cord showed slight motility.

Result. Treatment was continued a little longer, then the man was discharged from service. The end-result is not known.

Comment. Here we have an illustration of how little damage a perforating bullet can do. It apparently passed between the trachea and the spinal column, carefully missing both as well as the esophagus, and failing to injure the vessels and nerves of the neck. There was a paralysis of the right inferior laryngeal nerve, but this was clearing. Apparently the blow from the passing bullet served to partially fix the right cricoarytenoid joint.

Case VIII. Diagnosis: Fixation of the left arytenoid caused by bomb fragment.

History. Pvt. N. K. was struck by a fragment from an aerial bomb in the Argonne Forest on September 28, 1918. The missile entered the neck in the midline at the thyroid notch and did not emerge, remaining deep in the neck near the left brachial plexus. There was bleeding from the mouth for a short time, but little dysphagia, and temporary paralysis and numbness of all the extremities. The wound discharged for one month and then healed. He was admitted on the neuro-surgical service at Cape May on December 5, 1918.

Examination showed a fixation of the left arytenoid. The left vocal cord was much swollen and was fixed near the midline. There was a compensatory motility of the opposing vocal cord, and a rather husky but fairly strong voice was the result.

Treatment. Silver nitrate was applied to the swollen cords. Electrical stimulation was given the larynx.

Result. Some improvement in the voice. Discharged in May, 1919.

Comment. The electrical stimulation of the paralyzed laryngeal muscle during the period of inferior laryngeal nerve rehabilitation was thought to have helped this progress considerably.

Case IX. Diagnosis: Gunshot wound of the trachea.

History. Pvt. C. F. was struck by a flying piece of shrapnel while in action on June 16, 1918. The fragment passed through the base

of the neck, anteriorly, from side to side. The trachea was cut. An operation united the cut edges of the trachea. A tracheotomy was not necessary. There was also a gunshot wound of the left chest. Both wounds had healed when he reached Cape May on September 14, 1918.

Examination. Vocal cords inflamed and thickened; moved symmetrically; no ulceration. Considerable subglottic edema present, hiding the trachea from view. Patient spoke in a whisper.

Treatment. Vocal training and electrical stimulation.

Result. The voice gradually returned, but continued husky and tired easily.

Comment. Skilful and prompt work at the Front was responsible for this favorable result. Even a tracheotomy was not necessary. This and Case II were the two cases in this series in which the trachea was injured. The European writers found injuries of the trachea relatively rare and serious.

Case X. Diagnosis: Laryngitis chronic and aphonia, from inhaling gas.

History. Cook J. C. L. inhaled "gas" while in the Chateau Thierry Sector, France, on July 17, 1918. Loss of voice followed. He was transferred to this country and arrived at Cape May on March 7, 1919.

Examination. Patient spoke with some difficulty and in a whisper. Both vocal cords were thickened but punched out by traumatism or ulceration; equally mobile but not approximating completely. Edges of cords coarse and lax.

Treatment. Local stimulation and voice-training.

Result. Patient was discharged on June 5, 1919, after prolonged voice-training. The voice on discharge was hoarse and but little better than a whisper. He was followed by the Public Health Service and they reported but little improvement. Attempts at further voice-training met with little enthusiasm or success. He was able to make himself readily understood.

Comment. This is a rather typical gas case. There were several of them at Cape May, but the larynges were not sufficiently injured to include them in this series. In this type the examination showed only a low-grade chronic congestion of the laryngeal mucous membrane. There was a troublesome cough, sometimes

a bronchitis. The voice would become hoarse and tire easily. Colds were frequent. The process was always indolent; there seemed to be little that we could do. The writer learned to have a wholesome respect for a so-called mild gas case. The unsatisfactory improvement in Case X was to be expected in the light of our experience with milder cases.

Case XI. Diagnosis: Laryngeal papilloma, from mustard gas.

History. Pvt. F. J. N. was burned with mustard gas on June 29, 1918, over his hands, thighs and scrotum. Two weeks later, while under treatment for the gas burns, his throat became very sore and swollen and he was unable to swallow. In another week the swelling had subsided, leaving him without voice. He was transferred to this country and reached Cape May on November 6, 1918, still speaking in a whisper.

Examination revealed two smooth soft polypoid masses, pedunculated, attached immediately below the right vocal cord, which came up between the cords on phonation, preventing complete approximation.

Treatment. The papillomata were removed under local anesthesia, by direct laryngoscopy, on November 11, 1918. The speech returned at once. The patient was discharged cured on December 16, 1918.

Result. In response to an inquiry this patient writes on April 22, 1921, that he caught a severe cold one month after his discharge, and during the cold, he could not talk above a whisper; that he has been able to talk since, but that the voice is hoarse at times and tires rather easily.

Comment. This is a different form from Case I. Mustard gas proved particularly dangerous in that patients and assistants in the wards could get fresh burns from particles coming from clothing, hair and dressings. Such was evidently true here. The throat was free until two weeks after he had the gas burn. Then, while in the ward, his throat became sore and swollen. From the burned areas the papillomata later sprang. Cure followed their removal. His subsequent hoarseness can be attributed to the indolent chronic laryngitis so many gas cases have.

Case XII. Diagnosis: Papilloma of the larynx from exposure.

History. Sgt. F. M. M. first noticed his hoarseness while on the

Mexican border in June, 1917. This disappeared of itself, to return while on duty in France in November, 1917, immediately after a severe cold with fever for ten days. No history of exposure to "poison gas" at this time. The voice continued husky.

Examination at Cape May on August 28, 1918. Both vocal cords present and movable; a little of the left appeared ulcerated away and a papillomatous mass filled the anterior commissure.

Treatment. Papillomata removed with forceps under direct laryngoscopy at three successive operations.

Result. Patient discharged on December 18, 1918, with vocal cords healed, slightly thickened and phonating normally. No papilloma seen. A speaking but husky voice was present. A letter dated April 21, 1921, says there has been no subsequent operative treatment; that the voice is erratic and he sometimes loses it for a day at a time. He is now an automobile salesman.

Comment. It was a debated point whether "gas" had anything to do with this case. His hoarseness began in earlier life, cleared, returned while he was on the Mexican border, to clear a second time, and finally returned to remain, under the rigors of army life in France, while acting as chauffeur for general officers up and down the line in all kinds of weather. When he came to Cape May the papillomata were of the classical type and their operative course was typical.

Analysis of Cases. An analysis of these twelve cases shows the cause of injury as follows: Exposure (meaning the bad weather conditions the soldier was at times exposed to) 1, gas 2, aeroplane fall 1, by gunshot wound 8, of which 3 were bullet, 3 shell fragments, 2 shrapnel. 2 cases developed laryngeal papillomata. The trachea was injured in 2.

In 6 cases a high tracheotomy was done. Three of these received a later low tracheotomy. The time elapsing between injury and tracheotomy was: One day in 3 cases, four days in 1 case, seven days in 1 case, seven weeks in 1 case. In 2 cases the tracheotomy tube had to be reinserted after too early a removal, in ten days in one and eleven days in the other. Of these 6 tracheotomy cases, the tube was permanently removed in 2 after three weeks, in 1 after one year, 1 is to have his removed soon, 1 will need some time yet, and the sixth was wearing his tube when last heard from.

Chronic chondrial fistulæ were present in 3. All are cleared. A

chronic laryngeal stenosis developed in 4 cases, requiring protracted operative treatment. Two thyrotomies were done, one the first day and the other nine months after the injury.

The present vocal result may be roughly classified as: whisper voice 4, weak hoarse 5, strong hoarse 3. Harmer's[15] vocal results in his collected 108 cases give fairer figures, as the 12 at Cape May were not an average group. His list gives: normal voice 17, strong hoarse 24, weak hoarse 12, falsetto 1, whisper 15, dumb 1, not stated 38.

There were no fatalities in our series. In general it may be said that the nearer the surgeon gets to the fighting line, the higher his death rate will be. In this English series 5 out of 108 died. In France the death-rate was much higher. The cases that lived a week usually survived.

CURATIVE MEASURES

Outline. To take up at length the methods employed by the different writers for the control of chronic laryngeal stenosis would be to prolong this discussion unduly. They may be summarized as follows: intermittent corking of the tube; peroral and retrograde progressive dilatation of the stenosis by bougies and hard or soft intubation tubes; cutting of webs or bands or annular strictures by knife or cautery; laryngofissure with immediate or delayed closure; and tracheolaryngostomy. All these methods excepting the last were employed in the Cape May cases. If one uses Moure's classification it is the circular or partial type of stenosis which can be cleared by the lesser measures, while the tubular or total type only yields to radical interference.

Tracheolaryngostomy. The most radical method of treating chronic laryngeal stenosis is by a tracheolaryngostomy as described by Jackson in this country and elaborated by Moure[31 32 33] and his French co-workers. The writer has had no experience with this operation. He shares with others the hope that lesser measures, persistently employed, will yield easier, earlier and better results. Important objections to the operation are: The closer confinement of the patient, the impaired speech during much of the time and the protracted time required. All inflammation must first subside before the laryngostomy is done and the severer forms may take one to three years after the operation before a plastic closure

of the wound can be undertaken. Nor is the case necessarily completed then.

Moure reports 24 cases of tracheolaryngostomy and Lannois[30] and his associates 14, and their recent reports are increasing these numbers. It is said that Moure has abandoned all other procedures in these chronic stenoses and lays the larynx open as the quickest, surest and most satisfactory means of cure. His book describes the technic in detail and is carefully illustrated, as well as giving the pathology and anatomy and finishing with his 24 case histories. The operation is done under novocain local anesthesia and may be briefly described as follows:[16 33]

Moure Operation. He splits the thyroid and cricoid and carries the incision down to include the tracheotomy opening. Here he finds the structures not always recognizable and frequently different from the peroral picture. He removes what scar tissue he can, avoiding the esophagus and the ventricular bands. The bleeding points are cauterized. The enlarged canalized cavity is plugged with a gauze roll containing an antiseptic and the tracheotomy tube is inserted at the bottom of the wound. An esophageal feeding tube may be needed for a few days. This dressing is changed every three or four days and replaced in three or four weeks by an intubation tube plugged with a special clip; or he passes his tracheotomy tube through a hole in the side of a soft rubber tube and inserts this. Granulations are treated with 10 per cent chloride of zinc or with silver nitrate. Intubation requires from twelve to eighteen months, after which the cannula can generally be removed and the open epidermatized trough be closed over by a plastic operation. A buried piece of cartilage may be used to give support to the covering skin flap.

His results in 24 operations were: 8 entirely cured and 16 well on the road to recovery. In the end result the patients breathe naturally and speak surprisingly well.

GENERAL COMMENT

Experimental. Burket[2] makes an interesting contribution to tracheal surgery. Working under sterile conditions he removed sections of the trachea from a cat, planted them in culture media,

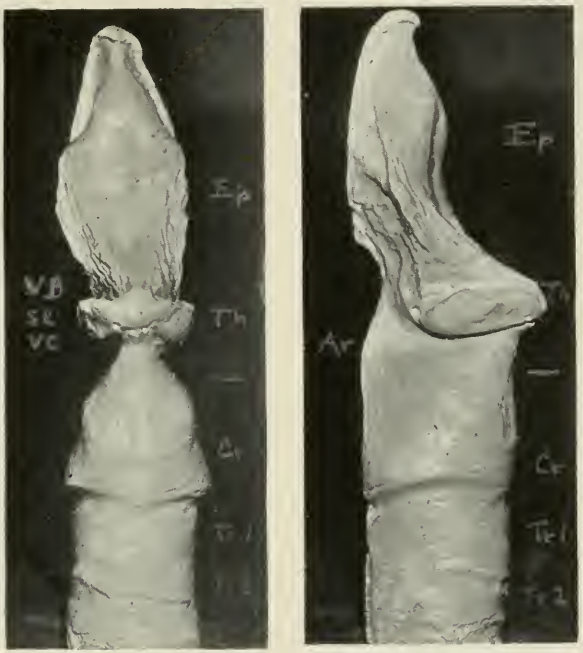
obtained no growth and concluded that the trachea is normally sterile. Then he cut away a section of trachea in eight different dogs, at once replaced the section, carefully sutured the approximated parts and closed the wound. Four survived and four died of dyspnea one to three weeks after the operation. Autopsy of the dead four showed the dyspnea to be caused by a tracheal stenosis at the point of section and suture, where microscopic sections revealed the successive stages of mild infection, granulation tissue formation and resulting annular stricture. The surviving dogs were killed and autopsied. Operative tracheal union was primary and without infection. He concludes that it was infection which caused the stenosis. The Cape May cases do not entirely bear out his conclusion, for two of the three active perichondritis cases were breathing perorally during months of fistulous discharge.

Anatomical. The writer feels that infection plays a very important part in acute cases, but that the presence of the tracheotomy tube plays a greater part in chronic stenoses. In Cases I, II, III and IV, after the infection and edema had disappeared, the stenosis was of the tubular type, began not at but just below the true vocal cords and extended down to the tracheotomy tubes when in the high position.

This subglottic space is frequently thought to be surrounded chiefly by the thyroid cartilage. In order to obtain a clearer mental picture of the inside of the normal larynx the writer made plaster casts of anatomical specimens. These casts show that the extreme top of the subglottic space only is covered by the lower edge of the thyroid cartilage and that all the rest is covered by the cricoid and first tracheal ring with the intervening membranes. The true vocal cords are 3 to 5 mm. above the lower anterior thyroid border. (See illustrations showing plaster moulds of larynx.)

When a high tracheotomy is done there is at once a space established between the tube below and the cords above through which no air passes. Nature tends to fill up such a dead space. Since the walls will not collapse the space fills up first with membranous edema. Then infiltration changes begin. The resulting stenosis is not so much a scar contraction as a new tissue formation built

in from the surrounding cartilaginous wall. To defeat this tissue infiltration Jackson advises the early diminishing of the caliber of



Anterior View. Right Lateral View.

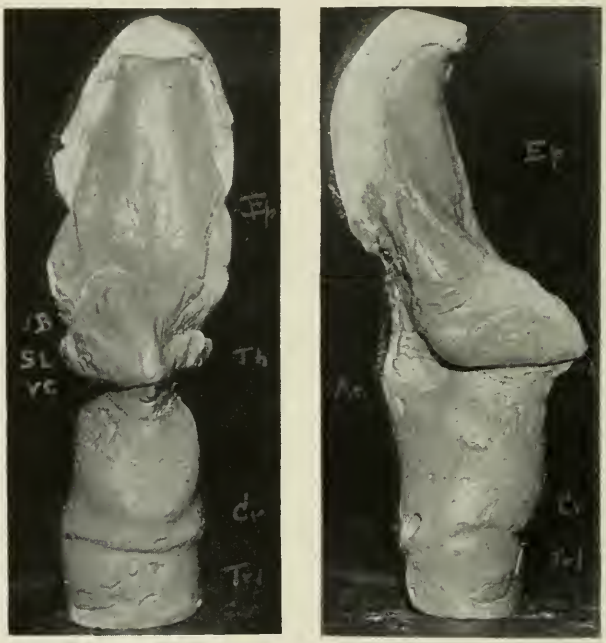
Plaster Moulds of Larynx, Actual Size.

These casts represent not the larynx, but the space inside of the larynx. The impression of the epiglottis was added in order to visualize relationships better. The pharyngeal portion of the cast was inaccurate and has been removed.

Note how the glottic space makes well forward into the thyroid notch region; how the anterior median line makes an angle of 90 degrees here. Also note the narrow glottic aperture and the broad cricoid space. In this specimen, the epiglottis is of the narrow curled type. The outline of the cricoid and first two tracheal rings can be readily distinguished.

Ep, epiglottis; Th, thyroid; Cr, cricoid; Tr. 1, first tracheal ring; Tr. 2, second tracheal ring; V.B, ventricular band; S.L, saculus laryngis; V.C, vocal cord.

the tracheotomy tube. More air can pass around a small tube, and this air column at once exerts a positive pressure where a negative pressure previously existed.



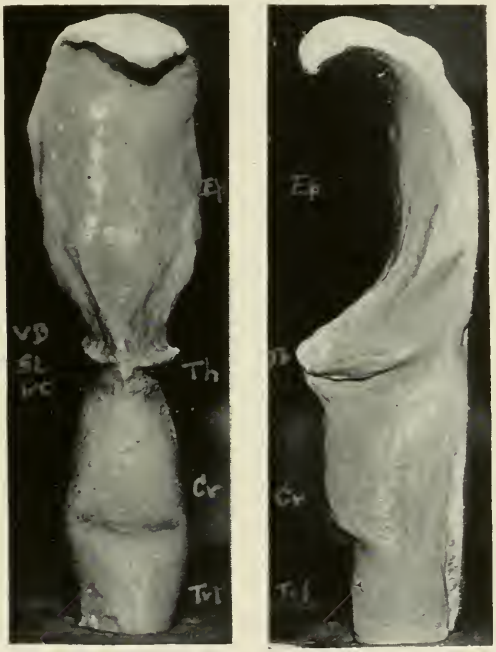
Anterior View. Right Lateral View.

Plaster Moulds of Larynx, Actual Size.

This epiglottis is of the broader type. Note the sharp anterior recess into the thyroid notch region and the broad space lower down where the cricoid is plainly outlined. The anterior line makes almost a 90 degree angle at the thyroid notch.

In Acute Forms. Let us carry this idea further. Does not an early and thorough débridement of the wound followed by wet antiseptic dressings, a prompt tracheotomy to ensure complete laryngeal rest, a suturing together of the injured parts when asepsis is obtained and an early changing to smaller tracheotomy tubes with encouragement of peroral breathing offer the quickest cure for a serious gunshot wound of the larynx? Boehler's[1] report from the Poland battlefield shows what favorable results an early

tracheotomy in all doubtful cases will yield. In a large number of cases he claims never to have had an edema of the glottis. Von Meurers[51] successfully performed a prompt thyrotomy in two of his cases. Our Case V fared better for this early radical interference. Unfortunately, such early expert aid cannot be always available on a long, moving, battle-line.



Anterior View. Left Lateral View.

This cast shows the same sharply receding epiglottis. The plaster was laid thin upon the epiglottis, hence its resemblance to the epiglottis itself. The dent just below the cricoid is due to a collapsing of the specimen at this point. The lateral view is "actual size," the anterior view is very slightly smaller. The saculus laryngis extended up under the false cord in most of the specimens but this prolongation was broken off in removing the cast.

In Chronic Forms. When, however, the case becomes a chronic one there is need of almost infinite patience on the part of both patient and surgeon. One discouragement follows another.

Progress is discussed in terms of months, not days. Whether, after lesser means have failed, tracheolaryngostomy will be the operation of choice the increasing experience of today and tomorrow will determine. The writer hopes a quicker method will

This picture is a little larger than the actual cast. It is shown in order to give relationships. On the model, the impressions made by the cartilages are discernible. These impressions were painted and the result photographed.

Note how the thyroid covers the middle portion through which pass the grooves made by the false and true cords. The cricoid covers but a small portion in front, and a broad portion behind. Below this comes membrane, then the first tracheal ring. The white area posterior to the true vocal cord and just above the cricoid, represents the position of the right arytenoid cartilage.

be discovered. If his Case III fails to improve soon under the present treatment he is contemplating the following procedure: a thyrotomy, the excision of scar tissue and the insertion of a stent the size of the dilated laryngeal cavity covered with a skin graft. He would suture the thyroid together over the stent if the tissues

will permit it, open the wound again after five to seven days, carefully remove the stent and then resuture in the hope that a chondritis had been avoided. Or if the thyroid had to be left open when the graft was planted he would hope to suture it together after the graft had taken. He does not know that this has ever been tried. The principle has been repeatedly used in oroplastic surgery and promises a great saving in time over the tracheolaryngostomy operation if the graft will take. Other methods will be devised. In time the technic will be so perfected that the surgeon will employ the direct operative approach with less hesitation than he does now.

May 1, 1921.

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CHRONIC OSTEOMYELITIS OF THE SKULL AS A COMPLICATION OF NASAL SINUS SUPPURATION

Candidate's Thesis.

JOHN D. KERNAN, JR., M.D.

This important complication of nasal sinus suppuration was for the first time considered in English medical literature in an elaborate paper by Dan McKenzie,[1] published in 1913. He quoted thirty-eight cases previously reported and added thereto ten cases, a total of forty-eight cases reported up to that year. He concludes that "these figures do not by any means represent the total number of cases of osteomyelitis that have occurred in the practice of recognized rhinologists within recent years, for there are very few specialists of position who have not at some time or another experienced one or more."

If McKenzie is correct in his conclusion many must either fail to recognize the condition or to report their cases, as only a few cases have been reported in the American literature since McKenzie's paper. As in spite of the thoroughness of his paper his conclusions as to etiology, prophylaxis and treatment are indefinite, a report of the following three cases may be of interest as contributing some material which may eventually be used to form a complete picture of the disease.

McKenzie divided the cases into those arising spontaneously and those which appeared to be excited by some operative procedure. Of the cases mentioned in the present report one spontaneously followed sinus disease and two were postoperative. As for the sinus of origin, forty-five of McKenzie's cases came from the frontal sinus and three from the antrum. Of my own three cases one began in the antrum and two in the frontal region.

[1] McKenzie, Dan: British Jour. Laryn., Rhin., and Otol., 1914.

The case originating in the neighborhood of the antrum cannot be considered, strictly speaking, as a case following sinus disease. Its relation may, however, assist in throwing some light on other cases which do have that origin. The history is as follows:

Case I. Joanna J., aged thirty years, a previously healthy woman, was referred to me in August, 1916, by Dr. Montgomery La Roche, of New York City. About May 1 of that year an abscess had been discovered at the root of the right upper lateral incisor and the tooth had been extracted. This procedure did not relieve the pain from which she suffered, and with the idea of giving further relief the first bicuspid was extracted and an opening made through its socket into the antrum, which cavity was irrigated, no pus being obtained.

At this time she was referred to Dr. La Roche. His *x*-ray films showed no dense shadow such as would be thrown by a gathering of pus, but a certain rarefaction of the bone, unnoted at the time, which in view of later developments was of great significance. He removed the first right upper molar and a considerable amount of necrotic bone from the alveolar process. This did not relieve her symptoms, and he referred her to me the middle of July, 1916.

In general appearance the patient was a young woman of robust health, somewhat worn by suffering and consequent loss of appetite and sleep. She was of a vigorous character and had been up to the time of her illness superintendent of nursing in a large institution.

Local examination showed discharging sinuses in the right upper gum, at the bottom of which could be felt bare bone. A puncture of the antrum through the nose brought away no pus, nor did it relieve her symptoms. She was admitted to the Manhattan, Eye, Ear and Throat Hospital August 1, 1916. Operation was performed August 12, 1916. An incision was made through the mucous membrane of the right upper canine fossa and carried down to the bone. The periosteum was found to be only loosely attached. The appearance of the bone was peculiar, black, and on cross-section the blood channels were seen to be filled with clotted blood as if death had been caused by shutting off the blood supply. The mucous membrane of the antrum was diseased only where it overlay necrotic bone. This may be of significance as showing that the disease originated in the bone and not in the sinus. Yet, on the other hand, it may have been that the circulation of the bone was strangled by the inflammation of the overlying mucous membrane.

The operative procedure consisted in removing widely the bone and

providing free drainage of the antrum into the nose. The incision over the alveolar process was closed.

This operation resulted in no relief of her pain, so she was readmitted to the Manhattan Hospital September 11, 1916. X-ray films of her right upper jaw were negative. Nevertheless, the wound above the right alveolar process was reopened. A patch of dead black bone, the size of a dime, was found near the midline and some in the region of the eminence. Both of these areas were removed, together with all the teeth of the right upper maxilla. All the right upper jaw had now been removed except a portion of the hard palate. This relieved her pain and she was discharged from the hospital seemingly well.

One month later she was again admitted to the hospital, this time with pain in the left side of the face. Although the region of her left cheek was extremely tender there was no swelling and the antrum and teeth were seemingly normal in the *x*-ray plates. Nevertheless, it was decided to explore the antrum. Accordingly, an incision was made over the left aveolar process and the periosteum stripped back; the appearance of the anterior wall of the antrum exactly paralleled that found on the right side, showing black necrotic bone with thrombi in the blood channels. All the teeth were extracted and the entire necrotic area was removed, with the aveolar process and eminence. This operation was unsuccessful in relieving her and never again was she free from pain.

Eighteen months later she was admitted to Bellevue Hospital much worn with suffering and her tonsils, which were diseased, were removed. Again no relief. One month later she was again admitted and it was determined to attack the second branch of the fifth nerve, to which the pain was confined. The region of the infra-orbital foramen was exposed. About it was a small area of necrotic bone. This was removed and the nerve avulsed. All that remained now of the maxillæ were the two horizontal processes. Pain continued, although the region of her cheek supplied by the fifth nerve was anesthetic. A further development now was the appearance of a swelling over the left mandibular articulation and pain behind the left ear in the region supplied by the auriculotemporal nerve.

A year later her condition was about the same. It was determined to attack the Gasserian ganglion. This was removed, resulting in the complete anesthesia of the left side of the face, but in no way was she relieved. Seemingly, the inflammation had spread from the bone to the sensory trunk of the nerve. When last heard from, nearly five years after the beginning of her illness, the patient was still suffering as severely as at first.

The Wassermann reaction in this patient was always negative. Cultures of the bone gave no definite results. Salvarsan and potassium iodide gave no relief.

It is by no means certain that the start of the trouble was traumatic, for the symptoms preceded the extraction of the first tooth. Perhaps at that time there was an osteomyelitis present. However it may have been with the disease of the right side, that of the left was surely not traumatic, nor did it arise from contiguity, as it began after the cure of the process on the right side and far from any area that had been diseased. The infecting organisms must have spread through some lymphatic connection. As for the pain it can be accounted for only by a neuritis spreading up the nerve trunk, as it persisted long after there was any possibility of pressure on the nerve by inflammatory products.

Certain striking features in connection with the case must be noted. In the first place there were never, except over one limited area mentioned above, that is the region of the left mandibular articulation, external signs of inflammation. Congestion was at no time a feature and there was no formation of pus. The disease advanced subtilely; there would be an increase of pain and then exploration would reveal the dead bone full of clotted blood. The constitutional symptoms as revealed in the temperature chart and pulse-rate were negligible. It must be noted also that the *x*-ray films were always negative. This is very different from Skillern's case,[2] recently reported, in which inflammatory symptoms and fever were marked. His, however, was an acute case. The physical deterioration was terrible to see. From a robust and efficient young woman, capable of supervising the nursing of a large institution, the patient was reduced to a pale, frail ghost of herself, whimpering continually for morphin.

How are we to account for this case from the point of etiology? What subtle combination of physical condition and infecting organisms made so common a procedure as the extraction of a tooth result in a steadily progressing, uncontrollable disease?

The author confesses that he is here totally in the dark. Patho-

[2] Tr. Twenty-sixth Ann. Meeting Am. Laryn., Rhin. and Otol. Soc., June, 1920.

logically the bone was reported as dead bone, not actively inflamed, showing no absorption. There was never any tendency toward sequestrum formation.

The treatment to be pursued in such a case is clear: It is surgical and must be radical surgery. The bone must be removed far beyond appearance of the disease, fresh forceps and curettes being continuously used. This plan was successful on one side of this patient's face. The recurrence on the other side was not, and could not, very well have been foreseen. Here the removal of bone never got ahead of the disease. Yet so slow was the advance that in two years only a small additional area had been involved. This too is to be thought of: Would successful removal of all diseased bone and arrest of the disease have relieved the chief symptom, the pain? In the end the sensory trunk of the fifth nerve was involved and removal of the ganglion had no effect. No diseased bone was found at this operation.

The two cases now to be related conform better to our title in that they occurred after long-continued nasal sinus disease.

Case II. The first of these is of Clarence B., a colored man, aged twenty-five years. His complaint was of a growth above the right eye which had existed for a month, gradually increasing in size, accompanied by pain so severe at night that he could not sleep (Figs. 1 to 5).

He was admitted to the Bellevue Hospital, service of Dr. Coakley, March 21, 1919. The physical examination at that time was as follows:

"The patient was an adult black male, well developed but poorly nourished, conscious and rational, appearing to suffer much pain. Over the right frontal region was a swelling, not circumscribed, about 6 cm. in diameter and mottled. This mass fluctuated in places. Exploratory puncture revealed the presence of pus. Both nares were full of pus coming from the middle and superior meatuses. Pus was found in both antra upon irrigation."

The general physical examination was negative.

On March 27 operation was performed. An incision was made from the median line to the external limit of the supra-orbital ridge on the right side. From the inner end of this an incision was carried vertically up in the midline for two and a half inches (Fig. 1). On turning back the triangular flap thus outlined a large abscess cavity was opened (Fig. 3). The periosteum was eroded and the bone was

FIG. 1.—Lateral view of Case II.

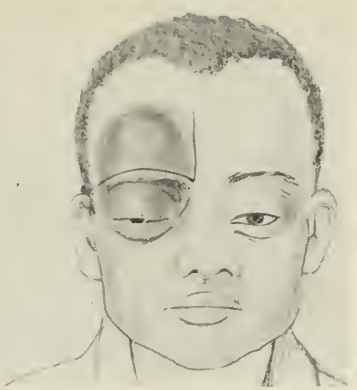


FIG. 2.—Frontal view of Case II, showing incision of first operation.

FIG. 3.—Case II after elevation of soft parts, showing granulations breaking through external plate.

soft, with granulation tissue breaking through it. The bone overhanging the frontal sinus was removed and the sinus, though very small, was found to be filled with granulations (Fig. 4). On curetting these out the plate overlying the dura was seen to be necrotic; removal of this revealed abscess pockets over the dura. A large part of the

Fig. 4.—Case II, condition found after removal of anterior wall of frontal sinus.

right frontal bone was necrotic and eventually an area of dura was exposed which reached three inches above the supra-orbital ridge and from the right external angular process to a half inch beyond the median line on the left side (Fig. 5). Although the limitation of the disease to these areas was by no means certain, on account of the patient's condition, the operation had to be stopped.

The reaction to the operation was very favorable. There was

scarcely any rise in the temperature and the wound healed rapidly. He was discharged in a month, with the wound practically healed except for a small sinus, and free from pain. The nares, however, were still filled with pus.

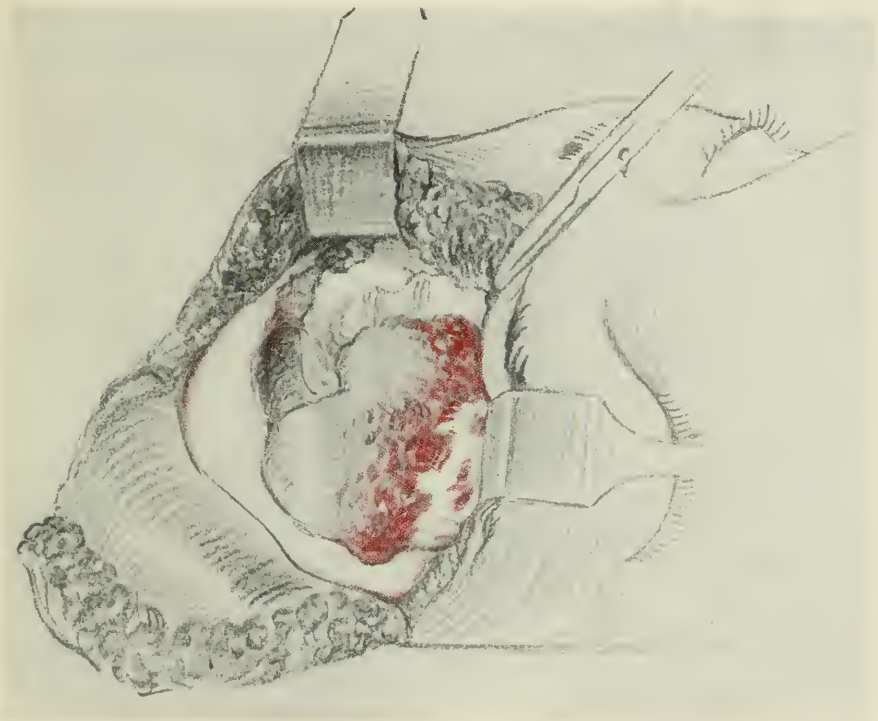


Fig. 5.—Case II, completion of the first operation, showing exposure of the dura.

He was readmitted to the hospital three weeks later. After discharge his cranial pain soon had recurred. The physical examination showed a discharging sinus at the inner end of the operative incision, from which a probe could be passed to the right along the supra-orbital ridge and down into the nose. The left eyelid was swollen and edematous; there was edema over the ridge of the nose and slight edema of the right eyelid.

Operation, May 15. Incision along the old scar. Granulations curetted out and a large sequestrum, consisting of the nasal processes of the frontal bone, removed. An incision was then made on the right side of the nose, beginning at the lower border of the nasal bone, extending to the inferior border of the eyebrow. The periosteum was elevated and retracted, the inner wall of the orbit being thus exposed. The ethmoid cells and much polypoid tissue were removed.

The reaction to operation was favorable, with little or no constitutional disturbance. For several weeks the wound seemed to heal; then pain, much worse at night, interfering with sleep, appeared. The edema of the right eyelid increased and swelling rose far out on the left zygoma. An *x*-ray plate showed necrosis of the entire frontal bone, with evidence of sequestration in the coronal suture.

Operation, June 16. Opening of the original wound and removal of granulations along the site of the supra-orbital ridge. An incision was made over the left supra-orbital ridge extending down over the side of the nose. The inner wall of the orbit was exposed and removed. The ethmoid region (left) was filled with broken-down polypoid material, which was cleaned out. An incision was then carried along the sagittal line to the occipital bone and the left parts turned back to expose the entire frontal bone. It was found to be honeycombed with pus and granulations, so that its external plate looked like lacework. An attempt was made to remove all this diseased bone, but hemorrhage was so profuse that the attempt was given over and the wound hastily packed. The patient died soon after leaving the table.

The etiological factor in this case was a long-continued pansinusitis. The conditions could not have arisen in the short period of one month, the time the patient reported his symptoms to have been endured. The character of the bacteria found in the pus and the appearance of the necrotic bone threw no light on the question of origin. Syphilis as a cause is less lightly dismissed, as the patient reported having been infected. Yet his Wassermann reaction was always negative and antisyphilitic treatment gave no favorable result.

The treatment was an attempt to remove all diseased bone. The failure came from the extent the process had attained before the patient came under observation. It is almost impossible to remove all of a man's skull without immediately fatal results, as in this case. The author feels now that if he had made repeated

operations rather than attempting to do all at once until the limits of the disease had been reached, and had pushed salvarsan more vigorously, he might have been more successful.

Case III. The second of this group came under observation five months ago and is still under treatment (Figs. 6 and 7). He was admitted to Bellevue Hospital January 15, 1921, complaining of pain

Fig. 6.—Case III, showing condition of patient ten days after the first operation.

in the forehead, obstruction of breathing and nasal discharge. The onset of his trouble was insidious, dating back two years before his admission, beginning with repeated colds in his head. He noticed that the symptoms were much worse the past six months. He first went to Dr. A. C. Howe, of Brooklyn, with a history of frontal sinus trouble extending over a period of several years. About that time, in the middle of November, 1920, the patient had a pansinusitis on both sides. An intranasal operation was performed and the nasal passages on the right side found full of necrosed bone and polypi; the sphenoid

and ethmoid were opened up and the frontal sinus drained. The left side also was found in the same condition and the ethmoid and sphenoid were uncovered and an abscess was found anterior to the ethmoid cells. A few days after operation a cellulitis of the left orbit developed which cleared up in two or three days. A week later this returned and progressed so that in a week or so a Killian operation was performed. Opening up into the orbit a considerable abscess was found and a perforation through the lachrimal bone. This was curetted out and

Fig. 7.—Case III, present condition.

drainage established down into the nose from the orbital abscess. Two weeks later a cellulitis developed over the frontal ridge and into the orbit. The Killian incision was reopened and the frontal bone was found to be necrosed.

This patient's physical examination on admission to Bellevue Hospital showed a man of twenty-one years, not acutely ill, somewhat undernourished and anemic. The internal organs were negative. There was a discharging sinus at the inner canthus of the left eye.

Both nostrils were full of pus. Polyps showed in both ethmoid regions and pus was washed from the antrums.

Operation, January 26, 1921. Usual skin preparation with iodin and alcohol. The incision was made over both brows from the midline, being wing-shaped. The anterior frontal walls were found necrotic and removed with chisel and gauge. The sinuses were filled with thick dirty granulations and pus. After removing the anterior walls and supra-orbital ridges several large cells were encountered and removed. On the left side the inner orbital wall was found necrotic and partially removed. The persistent sinus present along the former incision at the left side of the nose was curetted and freed of pus and granulations. Owing to the fact that the patient's pulse became rapid and feeble further operation was not deemed advisable. The wound was packed with iodoform. Partial closure toward the middle line was made with chromic catgut sutures.

The reaction to the operation was favorable. There was little rise of pulse or temperature and very little shock.

The local reaction was not so favorable. The exposed bone retained a dead-white appearance and only slowly became covered with granulations. These granulations were soft and of unhealthy appearance. The incision closed in the middle line, where it had been sutured, but from under each flap laterally there continued to be a discharge of pus. In each nostril also could be seen masses of polyps and each antrum discharged freely. His subjective symptoms were of no account.

Two months after the first operation a large sequestrum became free and was removed. This included a large part of the posterior wall of the frontal sinuses and a considerable area of the dura covered by granulations was exposed. After this procedure the local condition rapidly improved. Over the right eye the wound closed and over the left also, except for a small sinus which led toward a mass over the parietal eminence. This was incised and a large amount of pus released. No bare bone could be felt, only a cavity lined by granulations.

The story of this patient to date, four months after the first operation, continues that already given. Three more abscesses over the skull have formed and been opened. There is at present a new one forming over the left zygoma. The severity of the suppuration in the nose has subsided, so that little pus comes from there. His general condition is excellent; he has gained in weight, in strength and has improved in color. He is receiving now a staphylococcus vaccine, repeated doses of salvarsan, and for local treatment the incision of the abscesses as they form with the use of Dakin's solution.

This treatment is very different from that used in the case of the colored man already described, being as conservative as the other was radical.

In etiology this case is as obscure as the others. He had a long-continued sinus suppuration, treated according to accepted standards, and for some unknown reason developed a chronic osteomyelitis. The bacteriology of the case tells us nothing. His Wassermann reaction was negative. His general condition was fully as good as that of most patients suffering from chronic sinusitis. Did the osteomyelitis follow from the first operation or was it already present? This question cannot be answered with certainty, nor can it in any similar cases. At least it may be said that it was already present at the time of the first operation at Bellevue Hospital, his second. From then on the disease followed its accustomed course.

I should like now to discuss these cases in connection with McKenzie's paper and certain other cases which have recently been reported in the American literature.

As to the etiology, McKenzie[3] states that the precise factors that lead to the onset of the disease are unknown, but that extensive operative exposure and vigorous curetting of the walls of the sinus predispose. This does not account for the very large percentage of cases which arise spontaneously, as in one of the cases here reported.

Moreover, the disease may arise after an incomplete operation, where neither extensive exposure nor vigorous curetting were factors. For instance, Dr. Neil Maclay[4] reported a case which followed eight years after a radical antrum operation and intranasal operation for polypi. After these procedures the patient was free from symptoms for eight years, then reported in good condition except for postnasal dropping. An intranasal was done to drain the frontal sinus and an acute osteomyelitis followed with prompt death.

Dr. C. N. Byrd, of New York City, in a personal communication to the author, reported a case which followed a bilateral Killian operation for acute frontal sinusitis and ethmoiditis. His patient

[3] Loc. cit.

[4] Jour. Laryn., Rhin., and Otol., June, 1917.

was discharged from the hospital seemingly well one month after operation. Two weeks after discharge he returned to the hospital with several nodules about the size of an egg scattered over the scalp. X-ray plates showed extensive osteomyelitis of the skull. No extensive curetting was done at the Killian operation, only enough bone removed to establish drainage.

Hence, in view of these cases, it appears that although McKenzie may be correct in his conclusion as to the danger of extensive curetting in frontal-sinus operations, his conclusions may be questioned.

Many authors are convinced that syphilis is the underlying cause of these cases, although the Wassermann reaction may be negative and antisyphilitic treatment have no effect on the course. Thus, Skillern in reporting recently a case of acute osteomyelitis of the maxillæ stated that he was convinced that the case was syphilitic. There is no doubt that syphilis may be involved in many of these cases. Yet in some it may be barred out by every known test. So we must conclude that the etiology of these cases is obscure. The one thing common to all the chronic cases is long-continued, neglected, nasal sinus suppuration.

In regard to treatment, McKenzie's plan was radical removal of all suspected areas. This plan was followed by the author in one of his cases, with an unsuccessful outcome. He feels that it would have been better to have attempted the removal in several operations rather than one, if this plan of treatment is to be followed. This was Skillern's plan in his recently reported acute case of unsuccessful outcome.

In discussing a case reported by Beaudoux,[5] Dr. Harry Pollock reported a case in which he had given twenty doses of salvarsan with a successful outcome after a year and a half. There is no doubt that antisyphilitic treatment should always be pushed to the limit whatever the result of the Wassermann reaction.

It is evident that these cases are to be divided into acute and chronic. Such a case as that of Skillern's, which pursued a rapid course, should be treated as radically as possible in order to get ahead of the disease. With chronic cases, such as those of Dr.

[5] Tr. Am. Opth. and Otol. Soc., 1916.

Byrd's and the author's, it may well be that conservatism is better. In his case Dr. Byrd contented himself with merely opening and draining the abscesses as they arose with the use of Dakin's solution and vaccine. This plan is being followed by the author with the case which he has at present under observation. Certainly, the impression made by the appearance of that case at the present time is favorable.

To sum up the question of treatment in these cases it would appear best in the acute cases to attempt to get ahead of the disease by radical surgery, removing bone to far beyond the limits of inflammation.

In the chronic cases two courses may be pursued: radical removal of diseased bone or removal of sequestra and drainage of abscesses as they appear with the use of vaccine. This seems to give fully as good results as the first.

Memorials

Stanton Abbee Friedberg

STANTON ABELES FRIEDBERG

1875—1920

Seldom has our Association suffered the loss of one who, although young, had already attained such marked distinction and who had given so abundant promise of a still more brilliant and useful career.

Dr. Friedberg died in Chicago, May 28, 1920. He was born in Chicago December 1, 1875. His mother was Laura Abeles, of Leavenworth, Kansas, and his father Cass Friedberg, a native of Germany. With the exception of the first year his boyhood was spent in Leavenworth, Kansas. His mother died when Stanton was six years old.

He attended the public schools and then went to the University of Michigan, Ann Arbor, for the term of 1892–1893. In the fall of 1893 he entered Rush Medical College and graduated in 1897. Having served one year's internship in the German Hospital of Chicago he entered the practice of general medicine in that city.

In 1900 he began to devote himself to laryngology, at this time becoming an assistant to the late Professor E. Fletcher Ingals. In 1903 he received an appointment to the staff of Cook County Hospital. In July, 1903, he went to Vienna to study and remained there until January, 1904, when he returned to resume his association with Dr. Ingals.

In 1906, by civil service examination, he obtained a place as attending otolaryngologist to Cook County Hospital. He continued as such until 1913, when he became chief of the ear, nose and throat department at that institution, in which capacity he continued until October, 1919.

Dr. Friedberg never failed to express the satisfaction he had derived during those sixteen years. He had obtained valuable experience and had been able to work out the ideas he had formulated concerning a special department in a hospital.

In 1905 he was made assistant instructor at Rush Medical College in the department of the ear, nose and throat, and in 1907 an associate in the same department. In 1913 he became assistant professor of laryngology and otology. The same year he was appointed consulting otolaryngologist to the Durand Hospital of the Memorial Institute for Infectious Diseases. In 1909 he received an appointment to the Presbyterian Hospital, advancing from the rank of assistant to that of attending laryngologist.

In 1906 Dr. Friedberg performed his first operation in bronchoscopy and esophagoscopy, this being the special work of which he so often spoke as a "specialty within a specialty."

In November, 1917, he received his commission as Major in the Medical Corps, U. S. A., and served eight months in the Base Hospital, Camp Doniphan, Fort Sill, Oklahoma. In September, 1918, he went to France as an officer with Base Hospital 85. He served eight months with the A. E. F., the time being divided between base-hospital work in Paris and Angiers, France. He was honorably discharged May 1, 1919. An extended and interesting account of Major Friedberg's "Experiences and Observations in the Service" is given by him in the volume of our *Transactions* for 1919.

It was typical of Dr. Friedberg that, although working long hours under trying conditions, he accomplished in the course of his military service what he himself considered the best of his original scientific work, namely, the investigation and the solution of the diphtheria carrier problem. This work, leading up as it did to the understanding of conditions depending upon the "carrying" of other forms of infectious microörganisms, will always remain one of the most valuable contributions to modern medicine, a monument to the genius, energy and trained technical ability of our much lamented friend.

He was a member of the American College of Surgeons, the American Laryngological Association, the American Laryngological, Rhinological and Otological Society and the American Peroral Endoscopists. He was an active member of the Society of Medical History of Chicago, also the American Medical Association, Chicago Medical Society, Illinois State Medical Society, Chicago

Laryngological and Otological Society and the American Academy of Ophthalmology and Otolaryngology.

As a scholar and antiquarian Dr. Friedberg possessed unusual gifts. For about ten years he had been an interested student and collector of rare medical books, especially those relating to his own field of work. The old-book shops in many cities were familiar to him, and, with his fine memory and excellent judgment, his selections were wisely made. Upon the subject of old surgical instruments he was an authority, as proved by his admirable thesis on "The History of the Tonsillotome." A wide and careful reader in the realm of medical history, he was particularly well informed in this department.

The circumstances of his death were peculiarly tragic. It occurred as we were assembling for our annual meeting last year under the Presidency of Dr. Pierce, one of Dr. Friedberg's most devoted friends. Referring to him, Dr. Pierce has written: "We who knew him best loved him most. Dr. Shambaugh, who was associated with him on the college faculty in positions where conflicting interests might easily have caused friction, appealed to me for assistance in operating upon Dr. Friedberg, feeling that the deep affection he bore might unsteady his hand, since, as he said, he could not have been more profoundly moved had Dr. Friedberg been his brother.

"And so it was with all of us. Honest and painstaking in his work, his patients uniformly held him in the highest respect. He was skilful, too, especially in the use of bronchoscopic instruments. In this field he was regarded as the most expert operator in the Northwest. I believe that he was destined to occupy a high place in his profession. His untimely death has left a space among us which cannot easily be filled."

No more beautiful compliment could have been paid an aspirant for professional honors than the appreciation and confidence of the late Dr. E. Fletcher Ingals, that exemplar of discerning truthfulness and of staunch integrity. He early recognized in Dr. Friedberg the rare qualities of his character and of his mind, and so recognizing them devoted his best energies to the training and advancement of his pupil, of whom he many times expressed to me with enthusiasm his admiration and respect, predicting for him a

life of great usefulness and success. The affection of Dr. Ingals was genuine and deep, as must have been the case with all who were his associates, than whom none were more loyal and devoted friends than ourselves.

In 1906 he married Aline Liebman, of Shreveport, La., who survives him with three children, Stanton, Jr., Jean and Louise.

Walter J. Freeman

WALTER JACKSON FREEMAN

1860—1920

Walter Jackson Freeman died on December 20, 1920, from carcinoma of the liver. He was an upright gentleman, beloved by his colleagues and patients. After a year of suffering, patiently borne, he died unafraid.

Dr. Freeman was born in Beverly, N. J., December 22, 1860. He was decended in a direct line from Henry Freeman, one of the earliest settlers of Woodbridge, N. J. Henry Freeman was born in 1670. Dr. Freeman's father, Walter Freeman, was general freight agent of the United Railways of New Jersey. He was a man of great executive ability, and as a successor to his cousin, William S. Freeman, managed practically all of the freight shipments between New York and Pittsburgh, the two of them covering a period of over eighty years. A real American ancestry of men who achieved was Dr. Freeman's heritage. His early schooldays were spent in a boarding school at Andalusia, Pa. Later, he attended for six years the Ury School at Fox Chase and prepared for college at the Cathedral School at Garden City, L. I. He entered Cornell University in the fall of 1879 and was elected a member of the Psi-Upsilon fraternity. Two years later, however, on account of a breakdown in the health of his father, he was forced to leave college and went abroad with his father during the summer in the hope that the latter's health would be restored. On returning in 1881 he entered the College of Physicians and Surgeons in New York, as at that time he expected to settle and practice in NewYork City. Subsequently, however, he found it advisable to locate in Philadelphia, and his last year in medicine was spent in attending clinics and lectures, both at the University of Pennsylvania and at the College of Physicians and Surgeons, traveling back and forth from Philadelphia to New York almost daily. He graduated from

both schools in 1885. His graduating thesis was the same for each college, being read at one by a friend and at the other by himself. His internship of one year was spent in the Episcopal Hospital of Philadelphia. He then went to Europe, where he stayed three years, studying in Würzburg, Munich, Berlin, Vienna and Florence. For his teachers he had men whose names today are foundation-stones of medicine—Kölliker, Koch, Virchow, Stohr, Rindfleisch, Vierordt and Nussbaum.

In 1889, he came back to America, and after a vacation trip to Alaska he started in to practice in Philadelphia in December of that year.

In his study abroad, althought Dr. Freeman was probably thinking of some time devoting his life to otolaryngology, his training was chiefly in the fundamentals of medicine. However, after taking up his practice in the city of Philadelphia he soon devoted his entire time to the specialty which became his life-work. For two years only did he practice general medicine. His enthusiasm and skill as a specialist brought him to the attention of the leading practitioners of his chosen city, and he was soon recognized as one of Philadelphia's leading laryngologists.

In 1893 Dr. Freeman was elected adjunct professor of laryngology in the Philadelphia Polyclinic and full professor in 1895, which position he held until 1906, when he retired as emeritus professor. He was also laryngologist to the Children's Hospital of Philadelphia and to the Orthopædic Hospital and Infirmary for Nervous Diseases, and was consulting laryngologist to the Pennsylvania Institute for the Deaf and Dumb. He was elected a member of the American Laryngological Association in 1901, and he was also a member of the American Laryngological, Rhinological and Otological Society, though he resigned from the latter in 1908. He was a fellow of the College of Physicians of Philadelphia, being elected in 1890, also a member of the American Medical Association and one of the charter members of the Medical Club of Philadelphia.

In 1892 he married the eldest daughter of Dr. W. W. Keen, Miss Corinne Keen. There were seven children: five boys and two girls. Dr. Freeman found in his family the real happiness of his life and the inspiration of his ambitions. He loved the quiet

and joy of his home, and it was difficult to induce him to attend even important meetings or social functions. Nevertheless, he delighted in the companionship of friends and was loyal and sympathetic in his friendships. To understand and appreciate what a man he was, one had to know him as a friend, and I know few who felt more fully the love and affection of true friendship.

Dr. Freeman became a successful practitioner of laryngology for the simple reason that he deserved it. Possessing by nature an unusual amount of manual dexterity, he nevertheless spent many hours in perfecting his manual control until his manipulation of instruments could scarcely be excelled. He never took up direct laryngoscopy, probably because he never felt the need of it, his skill by the indirect method being such that intralaryngeal manipulations of almost every variety were done with the utmost ease and dispatch in both dispensary and office. In his operative work he was conservative, rather slow to take up with the modern radical procedures, and I doubt if he ever did a complete Killian sinus operation. By patience, perseverance and his unusual technic in intranasal manipulation he obtained results, however, in the treatment of sinus disease that might be envied by anyone. He always believed that the nose was an important physiological organ and that unnecessary destruction of its component parts was unjustifiable. As a diagnostician he had an uncanny ability, probably due in large part to great attention to details and to his unwearying patience and carefulness in examination. Although in his latter years he was crowded for time, he was never hurried and always took sufficient time to make sure of every fact that the case being examined presented. Because he knew his cases he was confident in expressing an opinion, and was not easily swerved from his opinion unless the error could be demonstrated. When, however, he could be shown an error in diagnosis, or that some other method of treatment or operation was a distinct improvement, he was quick to acknowledge the error and to adopt the improvement. He learned more rapidly, however, from his own experience than he did from the reported experiences of others. While this is true of the majority of men to a greater or less extent, I believe that Dr. Freeman, confident in the accuracy of his own observations, needed more proof than the most of us before accepting radically new or innovating propositions.

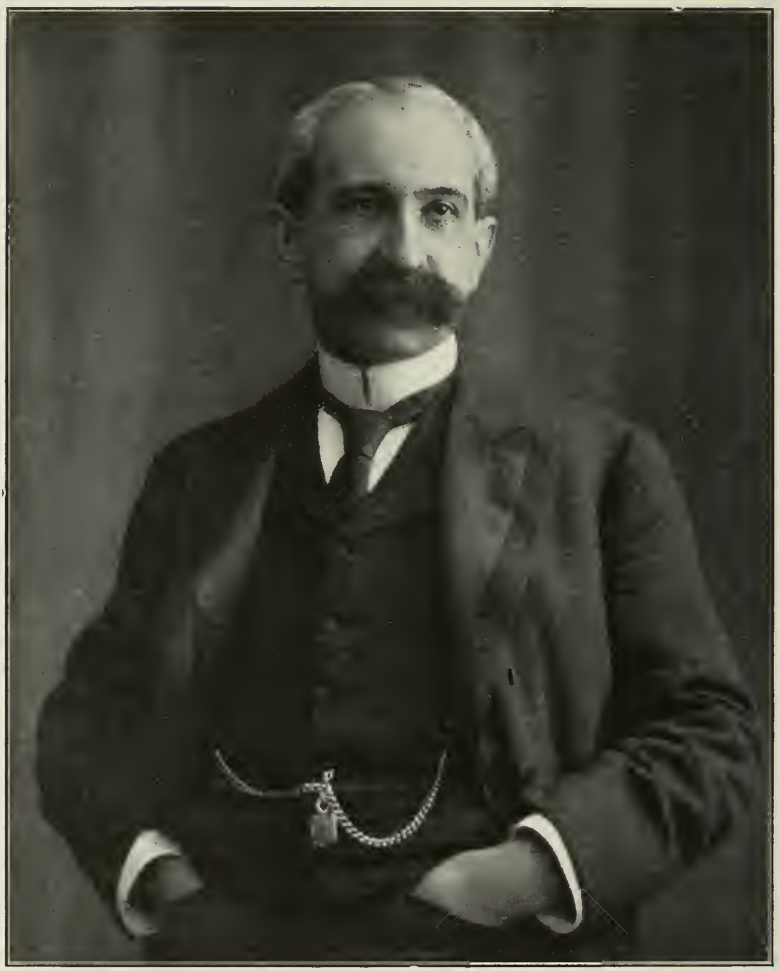
As a teacher he disliked didatic lecturing, but loved to get a few students around him in a clinic, and what a feast there was! To those of us who were privileged to be associated with him in his clinic there came a rare opportunity. We realized then what his mental grasp of the subject of laryngology was: we gained new enthusiasms, and, if it was in us, we learned laryngology, and above all we loved him as a teacher and friend.

He was not a prolific author, though in his early days he published a number of articles; many of them were original contributions based on his clinical experience. The more important of these were "The Operative Treatment of Purulent Disease of the Antrum of Highmore, with Exhibition of New Instruments," published in the *American Medical Journal*, November 30, 1895; "A Case of Rhinoscleroma Occurring in a Russian in the United States," published in the *Annals of Otology, Rhinology and Laryngology*, May, 1900; "The Nasal Septum," published in *The Laryngoscope*, October, 1901, and "Observations on the Diagnosis of Nasal Sinusitis," published in the *American Medical Journal*, July 11, 1903. He wrote the chapter on Physiology of the Upper Air Passages for the *American Text-book of Diseases of the Eye, Nose and Throat*, edited by de Schweinitz and Randall. His writing, like his clinical work, was characterized by attention to details and evidenced a thorough knowledge of his subject. His article in the *American Text-book* is a classic and is well worth the reading by even the present-day student. It is unfortunate for the laryngological world that Dr. Freeman permitted his growing practice to so crowd his time as to make it practically impossible for him to publish anything in his later years. By his careful study of the large amount of clinical material which had passed under his hand he acquired so much intimate detailed knowledge and developed so many important little technical procedures that in his practice he was almost unique. I would that his fellow-practitioners now had the opportunity of glimpsing at least a bit of his peculiar knowledge and technic.

During the last eight to ten years of his life Dr. Freeman was not in very robust health, and he felt that he had to conserve his strength as much as possible in order to "carry on" with his always increasing practice. May be this had a great deal to do with his

gradually withdrawing from active participation in society meetings and other public functions. After an attack of influenza in January, 1919, he failed very distinctly, but there was not a thought of a fatal illness until the summer of the same year, when, as he told me later, he first diagnosed his own condition. During the following autumn neither to his family nor to his friends did he mention his suspicion of malignant disease, and he tried even to prove to himself that his earlier suspicions were wrong by repeatedly seeking for other explanation of his failing health. He worked at his practice to the utmost limit of his strength, gradually becoming unable to do more than attend to his office work. Finally even this work became too great for him, and though he lived for almost a year after retiring from active work, he was confined to his bedroom. During these trying days his cheerfulness was remarkable, and when his strength was sufficient he had a smile and welcome for all his friends. His room was a hothouse of flowers. His old patients kept regularly sending him every week floral tributes of their affection. Dr. Freeman was not a great scientist—he was not a great author—but he was a great practitioner of laryngology. To his patients he gave all that he could, all that he had of wisdom and technical skill, and this was much, and his patients loved him.

He was a kindly gentleman, sympathetic and loyal to his friends, an earnest and patriotic citizen, a laryngologist whose place cannot be filled; upright himself, he was compassionate for the faults of others, finding his chief joy in rendering faithful service to those under his professional care and in the affection of his beloved family.



Felix Semon

SIR FELIX SEMON

1849—1921

The death of Sir Felix Semon, which occurred March 1, 1921, removed one who in his lifetime did much to promote the advancement and uphold the knowledge of laryngology. Dr. Semon was born in Danzig in 1849, the son of a stock broker. He began his medical studies at Heidelberg in 1869, but entered the Prussian Army in 1870 in the Franco-Prussian War. After a short military service he went to Berlin, where he graduated in medicine in 1873, then going to Paris and to Vienna for graduate work, where he devoted special attention to diseases of the throat. In 1875 he came to London and became clinical assistant to Sir Morell Mackenzie, founder and Director of the celebrated Hospital for Diseases of the Throat at Golden Square. To Dr. Mackenzie's influence he owed his introduction not only to laryngology but also to London life and to the position thereby obtained. He decided to remain in London, and in 1877 was elected to the honorary staff of the Golden Square Hospital and in 1882 physician-in-charge of the throat department of St. Thomas's Hospital. In 1888 he was appointed laryngologist to the National Hospital for the Paralyzed and Epileptic.

During this time, in company with Dr. John N. Mackenzie, of Baltimore, and a number of other young assistants, he aided in the compiling of references for the monumental treatise on laryngology by Dr. Morell Mackenzie, then in preparation, an experience of great educational value to him in view of his future work.

Dr. Semon distinguished himself as a practitioner and diagnostician, and in literature as an original contributor and editor.

In the laboratory of Sir Victor Horsley, that master of physiological research, he followed Sir Victor's experiments in the innervation of the larynx and brought prominently before the

medical world the results of his efforts to prove the effects of cortical stimulus and irritation upon the laryngeal nerves. Horsley and Semon endeavored to establish the proposition that there is a proclivity of the abductors of the larynx to paralysis in lesions of the nerve trunks and centers. From these and other researches the generalization was arrived at that laryngeal paralysis, which involved the abductors, sometimes in association with the adductors, is due to organic disease, while motor paresis of the adductors is in a large majority of cases functional, more rarely myopathic.

While Semon was pursuing his investigations in London others elsewhere were equally interested in the subject. Foremost among these was Dr. Franklin H. Hooper, professor of laryngology in the Harvard Medical School; also Dr. Frank Donaldson, Jr., of Baltimore. Not always holding the same views the spicy controversies between them form an interesting feature of the literature of the later 80's.

Lists of the most important of his many writings, including those upon the work done in collaboration with Sir Victor Horsley and with Sir Henry Butlin, may be found in the current British journals, but space is insufficient to give the titles of all.

Following the period of his association with Sir Victor Horsley, Dr. Semon allied himself with Sir Henry T. Butlin, whose original improvements upon the operation of thyrotomy for incipient malignant growths of the larynx and whose unprecedented success in their practical application had marked a new era in the history of that disease. In company with Mr. Butlin, and carefully following the principles of operation which he had established, Dr. Semon reported a number of successful cases.

Dr. Semon's reputation as a laryngologist brought him many honors from the laryngological societies of the principal cities of the world. In 1894 the Kaiser conferred upon him the title of Royal Prussian Professor, and in England he received in 1897 the honor of knighthood. In 1901 he became physician extraordinary to King Edward VII, retiring in 1911 in favor of Sir St. Clair Thomson.

In 1884 he inaugurated the *Centralblatt f. Laryngologie*, a monthly periodical which confined itself to the publication of abstracts of current laryngological literature and to editorial criticisms.

It was suggested by the similar work of Dr. George M. Lefferts, initiated in the *New York Medical Journal* in 1878 and later continued by Dr. Lefferts in that finest of all special journals, the *Archives of Laryngology*. In 1893, just twenty years after the founding of the New York Laryngological Society by the late Dr. Clinton Wagner in 1873, Dr. Semon founded the London Laryngological Society, afterward merged into the Section of Laryngology of the Royal Society of Medicine, an institution inspired by and patterned after the New York Academy of Medicine. Following his retirement as specialist to King Edward, he withdrew from practice and lived quietly at his place in the country up to the time of his death.[1]

[1] For extended memorials see British Medical Journal, London Lancet, both of March 12, 1921, and The Laryngoscope, May, 1921.

George M. Lefferts

GEORGE MOREWOOD LEFFERTS.

1846—1920

The passing of George Morewood Lefferts marks the close of an important era in the history of laryngology, as well as the departure of one whose lifework exercised no little influence in the development and dissemination of the knowledge of his art.

Student, pioneer, organizer, instructor, practitioner and always leader, we may with profit to ourselves study the incidents of his brilliant and eminently useful career, and analyze the elements of character and of disposition which contributed to its success.

Dr. Lefferts was born in Brooklyn, N. Y., February 24, 1846. His grandfather was of a distinguished Dutch family of New Amsterdam, the original member of which came over from Holland in 1660. The maternal grandfather was Gilbert Allen, an oldtime merchant of New York, but like, the grandmother, of the purest and best of the original New England stock, one branch dating back to the *Mayflower*.

Marshall Lefferts, his father, was by profession an electrical engineer in New York, and the inventor of improvements in telegraphy. He was a man of strong character and remarkable physical perfection, possessed of characteristics which easily placed him in successful command as Colonel of the 7th Regiment N. G. S. N. Y., then as now the best regiment of militia in the United States. At the time of the Civil War, with the capital practically unprotected, the 7th Regiment was the first to reach Washington, thus relieving the keen anxiety of President Lincoln, who for eleven trying days and nights had watched from the windows of the White House the campfires of the enemy just across the Potomac. As a child the writer was one of the deeply moved throng which cheered the gray-clad regiment as it made its splendid march down Broadway, with Col. Lefferts at the head. Twice

in these later days, under other fine leadership, has he witnessed this same stirring pageant, but neither these nor others of their kind have dulled for him the thrill of that early memory. So well had the men of the 7th been instructed and trained for military duty under the leadership of Col. Lefferts that of the 1100 composing its roster 620 were quickly selected as officers and placed in command of less-experienced troops, a service nobly repeated in the Spanish and World Wars. The history of the father was exemplified in that of the son, who, no less a captain of men, trained an army of leaders in the march of scientific progress. The inventive genius, the initiative, the ability and the power to command which were so conspicuous in the son were clearly inherited.

Dr. Lefferts's preliminary education was received in the public schools of New York, and he was graduated from the College of the City of New York in 1867. He at once entered the College of Physicians and Surgeons, Columbia University, receiving the degree of M.D. in 1870. In 1869 he received the Honorary Degree of A.M. from Dickinson College, Carlisle, Pennsylvania, and in 1901 the Degree of M.S. from Columbia University. Upon graduating in medicine he filled a short interneship in Bellevue Hospital, New York, passing from that to an eighteen months' service at St. Luke's Hospital.

Following the fashion of the day, he then went to Europe, where he spent two years of well-directed, earnest work at the laryngological clinics of London, Paris and Vienna. His earnestness and ability soon recommended him to his instructors, who recognized in him a pupil sure to do them credit and were accordingly interested in him. This was particularly true in Vienna, where he attended the clinic of Professor von Schrötter, and later that of Professor Karl Stoerk, of the Imperial University. Upon the latter he made such a favorable impression that he was soon appointed Chief of Clinic, which highly creditable and advantageous position he held during the years 1871–73, until his departure from Vienna, being the first young American to have attained that coveted distinction. Upon completing his studies at Vienna he received from Prof. Stoerk a testimonial of which the following is a translation:

The undersigned hereby certifies that Dr. G. M. Lefferts has frequented his Laryngoscopic Clinic since October, 1871 with such zeal and success and has shown during his time of study such skill that he gave him the position of his assistant when it became vacant.

During his time of service Dr. Lefferts has repeatedly performed both operations for laryngeal polypi and other difficult intralaryngeal operations with such skill that the undersigned can certainly term him one of the best laryngoscopists. Dr. Lefferts has won this acknowledgement particularly from the fact that he represented me so efficiently in my courses on laryngeal diseases and laryngoscopy, that during my absence he conducted both the instruction of my students and the clinical treatment of the patients quite independently and to my extreme satisfaction up to the present time.

The only thanks for his efficient services that I can possibly offer him is to acknowledge them in documentary form and to recommend him most warmly to every one on account of his great attainments in medical science.

(Signed) Dr. Karl Stoerk,
Professor of Laryngoscopy and Laryngeal Diseases,
Imperial University of Vienna, etc.

Vienna, March 13, 1873.

Both of his Viennese instructors regarded his subsequent success with genuine pride. They were his warm friends for life. The same was true of those in London and Paris.

His student companions of those early days have always reverted with pleasure to the delightful impression everywhere made by him.

In 1873 he returned to New York, where he at once entered upon the practice of his profession, specializing upon diseases of the upper air-passages, and finding quite enough in that department to fully occupy his time and satisfy his ambition.

The same year he was appointed extramural teacher of laryngology at the College of Physicians and Surgeons, and in 1875 full instructor; later in the same year, clinical lecturer, and in 1876 Clinical Professor of Laryngology and Rhinology. This position he held until 1904, a period of service of over thirty years. Upon his retirement he was made Professor Emeritus by the Trustees of Columbia University.

Dr. Lefferts regarded his professorship as the highest honor and the greatest opportunity of his life. Notwithstanding his other

professional interests and accomplishments, this one was always his chief interest and pride. To it he devoted his best energies, unsparing of time, labor or financial outlay. Year after year his lectures were revised with scrupulous care, new illustrative material of every possible sort added, and improved arrangements made for the securing and demonstration of the best clinical material. The faithfulness of his attendance is attested by the fact that he missed but one lecture appointment in a period of more than twenty years.

The lectures were conducted with true military promptness and precision. Every detail was prepared and arranged in advance with the most minute care. No stage setting could have been more elaborately planned. Promptly upon the appointed hour and at the stroke of the bell, followed by his staff, he appeared before the class, faultlessly attired as for a court reception, his countenance radiating the earnestness and the enthusiasm which possessed his mind. He was the personification of the ideal instructor, impressing his audience with the thought that he held matters of great value and importance which he was earnestly anxious to share with them and which he strove with all his power to impart.

As a lecturer he was clear, emphatic, persuasive, and, if sometimes a little sententious, always so with the object of being impressive, never failing to hold the interest of his hearers and to send them away having understood and mastered what he intended them to know.

His assistants were carefully selected. Each was trained to the performance of a special duty, which duty, at the proper time, was expected to be executed with the promptness and accuracy characteristic of the professor himself.

For the illustration of the lecture everything was added in the way of object-teaching that his remarkable ingenuity could devise.[1] Each particular topic was illustrated by a series of charts, splendid pictures in water-color, showing every type and phase of the subject at hand. These were of large size, made by a specially trained and skilful artist under Dr. Lefferts's direct personal observation, from life and from models taken from the best authorities, the subject of each being clearly inscribed upon it. During the lecture the charts pertaining to the subject were displayed in full view of the class. To the collection of charts, which included

[1] See "Appendix," page 381.

upwards of 500 specimens, there was added a full collection of papier-maché models of the larynx, illustrating the anatomy and the various phases of the pathology, together with numerous well-mounted pathological specimens. The special instruments and forms of apparatus pertaining to the subject were displayed and as far as necessary described. Of these, as with the charts, there was a comprehensive and lavish outfit, carefully selected, instructive, and collected regardless of expense.

But this was not all. Dr. Lefferts was a remarkable draughtsman. His blackboard drawings, with colored chalk, were superior to any of his time except those of the late Professor John C. Dalton. Wherever desirable the larynx or pharynx of the patient to be demonstrated was illustrated on the board in the presence of the class, the process of the drawing going on with the description of the case.

These so-called "lectures" were by no means what is understood as "didactic." The lecture itself, fine as it was, was but a necessary preliminary, explanatory of the principal feature of the exercise. This was the actual exhibition of patients. From the resources of himself and his many assistants, each of whom conducted large outside clinics, numerous cases illustrative of the subject in hand, suitable for exhibition and easy of demonstration, were sent to the College, the best selected, and these demonstrated personally by the Professor, a line of students being formed behind him in the amphitheater, each student in turn standing in a position close to the side of the demonstrator from which a clear view of the image in the mirror could be obtained. Time enough was allowed to enable each one to recognize the lesion shown, a general idea of which had already been given by the lecture and by the drawings, models and charts.

At the beginning of the annual session a printed scheme of the lectures was handed to the members of the class. Upon a printed folder was given the number, date and title of each lecture, with a comprehensive synopsis of its contents. By this means the student was apprised of the nature and scope of the course and was enabled in advance to prepare himself for each lecture by such reading and clinical observation as time and opportunity allowed. Subsequently the synopsis furnished an excellent basis for review and for the refreshment of the memory. In addition to this, pamphlets were distributed in the course of the lectures, some of which

explained the differential diagnosis between the principal laryngeal diseases, while others gave full and explicit directions for their treatment.

Supplementary to the regular lectures was a course of special instruction in the practical demonstration of the upper air-passages. This was carried on under the guidance of the Chief of Clinic and a corps of specially trained assistants. The class was divided into groups of six, and six lessons were given to each group —three lessons a week for a fortnight, the time devoted to each lesson being one hour. A special room was equipped for the purpose of this instruction, in which stalls for each student were provided, and these were furnished with the illuminators, models of the human head and the other appurtenances necessary for the examination of patients.[1]

The course consisted of instruction in the use of the instruments necessary in demonstrating the upper air-passages, including pharyngoscopy, laryngoscopy, anterior and posterior rhinoscopy, and the examination of infants. Life-size dissected models of the human head were supplied. These were invariably used preliminary to exercises upon the living subject, for the purpose of instructing students in the technic of the management of the head-mirror and in the rules for the application of laryngoscopy, pharyngoscopy, and posterior rhinoscopy. This method—employed by Türck and by the best of the other old masters—enables the student to first acquire the principles of the technic of the examination without his attention being disturbed by the discomforts of the living subject. The principles having been mastered, normal subjects were at once supplied, and, later, more extended courses were given in the examination and diagnosis of pathological conditions.

Scrupulous care was taken to superintend the work of each individual student and to see that the rules taught were thoroughly explained, understood and mastered. At the close of the course of instruction the men were well grounded in the rudiments of the work and reasonably prepared for its further advancement.

The admirable working of this system of practical instruction began to be impaired when the number of students in a group was increased to eight; when the number became twelve it was almost impracticable; and when, at last, the order went forth that the class

[1] See "Appendix."

should number twenty, the time for the method had gone by. Students who had profited by the course of lectures and practical instruction herein described graduated with a profound respect for laryngology and a clear knowledge of its principles.

The system of instruction thus instituted, organized and conducted has been described in detail because never in the department of laryngology had there been a similar course. Others had taught the specialty, some wonderfully well; but nowhere, either in this country or in Europe, had the undergraduate ever had the subject placed before him with such clearness, such comprehensiveness and such practical success.

The department thus founded at the College of Physicians and Surgeons was the result of lavish expenditure and of patient, unremittingly labor covering the period of a generation, by a man peculiarly endowed. He left it a perfect thing, a splendid model for the whole system of clinical instruction in general, and as such alone it was most desirable that it should have been permanently preserved.

In 1904, completing an active service of over thirty years, Dr. Lefferts resigned his professorship and was at once elected Emeritus Professor by the Trustees of Columbia University and at the following commencement was awarded the Honorary Degree of "Master of Science" (M.S.). The minute entered upon the archives of the institution reads as follows:

> The Faculty of the College desires to express its high appreciation of the distinguished services of Dr. George M. Lefferts, which through three decades he has rendered to the institution. The organization and maintenance of an important, practical, clinical department in the College—eagerly sought by the students of successive generations and a model of efficient administration—we recognize as a large achievement in the career of a practitioner. This long and faithful service and the generous gift to the College of a valuable collection of illustrative specimens and charts are held in high appreciation by his colleagues. This collection, by resolution of the Trustees of Columbia University, adopted November 2, 1903, is known as the "Lefferts Museum of Teaching Apparatus in Laryngology and Rhinology."[1]

Dr. Samuel W. Thurber, for many years Dr. Lefferts's associate, has prepared an elaborate "order-book" of the Lefferts lectures.

[1] See "Appdndix."

This book is now deposited in the department of "Columbiana" in the Library of Columbia University. It presents in detail, drawn to scale, the precise position in the amphitheater of all the apparatus used in the illustration of each lecture, together with photographs showing the amphitheater so prepared and equipped. A full collection of these pictures is given in the appendix to this memorial. It is an interesting and instructive exhibition in itself and, incidentally, an example of the finished exactness characteristic of the man.

When Dr. Lefferts returned to New York, in 1873, there was no society of laryngologists in any city in the world. In October of that year the New York Laryngological Society, now in successful existence for nearly half a century, was founded by Dr. Clinton Wagner. Dr. Lefferts was one of its charter members. This society, in 1885, became the Section in Laryngology of the New York Academy of Medicine.

In 1878, Dr. Lefferts was one of the founders of the American Laryngological Association. His address delivered at the opening of the first meeting clearly and eloquently set forth his ideals of the aims and functions of such a society. It was he who originated the name of the Association, and, as its first secretary, was chiefly instrumental in its successful organization and in establishing for it those high ethical and scientific standards under which it has flourished preëminent for more than forty years.

The development of his system of undergraduate instruction, and the part which he played as a pioneer in the establishing of not only the first, but by far the best, of the societies devoted to his specialty were by no means his only notable achievements.

His career in the field of clinical medicine was conspicuous. Prompt, energetic, efficient, a specialist skilled in every department of his art, his personality combined with the interest which he invariably manifested towards his patients caused his private practice and his public clinics to grow rapidly in numbers and in fame. He was appointed laryngologist to the then popular Demilt Dispensary, in 1873, in company with Dr. Charles McBurney. This department soon gained a name for itself, Dr. Lefferts serving it for six years.

It was at the Demilt Dispensary, in 1873, that Dr. Lefferts, with others, established a regularly organized system of instruction

for graduates in medicine, nearly ten years before the founding of the New York Polyclinic and the New York Post-Graduate Schools.

He was the leading member and largely the organizer of the throat department of the New York Eye and Ear Infirmary, receiving his appointment in 1874 and holding it until 1891. He was appointed consultant to the outdoor department of Bellevue Hospital in 1886, and was consulting surgeon to St. Luke's Hospital from 1877 until 1901. These appointments, together with his large clinic at the College of Physicians and Surgeons, were filled by him with the utmost zeal. The amount of material at his disposal for his own observation and for use in the course of his lectures from his own clinics and those of his numerous assistants was enormous. His extensive private and consultation practice embraced a clientèle of the very first order of influence and importance.

Always with the advance guard, Dr. Lefferts distinguished himself in the literature of laryngology. His original theses, in a style well written, terse, and to the point, covered a variety of subjects and were valuable additions to the knowledge of the special topics with which he dealt.

In the editorial department of laryngology he was again a leader. In 1880 there was no journal in this country which represented our special department of medicine. Dr. Lefferts, in association with Dr. Louis Elsberg, of New York, Dr. J. Solis-Cohen, of Philadelphia, and Dr. Frederick Irving Knight, of Boston, founded a quarterly magazine which was named *The Archives of Laryngology*. This periodical furnished another exemplification of the controlling principle of Dr. Lefferts's life. What his ambition demanded and what he ever strove to attain was, the best. In company with his distinguished collaborators, *The Archives of Laryngology* was made by far the best journal of laryngology that had ever appeared, in beauty of form and excellence of material surpassing anything abroad. Ably and generously conducted by its patriotic editors, at the end of four useful years it was discontinued by reason of lack of support, a grievous loss to the scientific world.

Dr. Lefferts was collaborator for the *Archives de Laryngologie* of Paris, and from 1884 to 1910 an active collaborator of the

Internationales Centralblatt für Laryngologie, Rhinologie, etc., of Berlin. He was associated with a number of other foreign periodicals. His name also appears as contributor to various systems of medicine and surgery.

With that ever-dominant desire to disseminate knowledge, one of his most useful missions was accomplished through the medium of abstracts, that is, the placing before the medical public the best of the new thought and ideas of the leaders of the laryngological world. In the classic work of Sir Morell Mackenzie, published in 1880, there was given an invaluable bibliography, dating from the earliest times. In May, 1875, Dr. Lefferts, in the *New York Medical Journal,* initiated the publication of a series of laryngological references accompanied by abstracts of such articles as were worth while. In this particular department there does not appear to have been any one by whom he was antedated. In 1880 the abstract department was transferred from the *New York Medical Journal* to *The Archives of Laryngology.* By the time the *Archives* went out of existence the *Index Medicus,* which had been instituted by Dr. John S. Billings, took over the bibliography, while the abstracts were continued in the *Centralblatt.* Thus, with the books of Sir Morell Mackenzie, the contribution of Elsberg,[1] the current records of Lefferts, the *Index Medicus* and the continuation of Lefferts's work in the *Centralblatt,* the *Laryngoscope* and other periodicals, the bibliography of laryngology is remarkably complete to date. Here, again, Dr. Lefferts was the pioneer. As collaborator with him for many years in this work, the writer well knows the importance which he attached to it and the tireless energy with which he carried it out.

Having thus sketched the life-work of Dr. Lefferts, let us now consider the personality of the man and the elements of character and of intellect which determined his success.

Early in life he had suffered a condition of lameness never entirely recovered from, and necessarily, to one of his sensitive nature and active temperament, a serious affliction. The eldest of seven children, the favorite of an indulgent family circle, one less resolute and of weaker moral courage might easily have failed of great accomplishment. Refusing to yield to the allurements of a life of indolent self-gratification, the burden of his disability was borne by him with the calmness of a philosopher and the fortitude of a

[1] Trans. Am. Lar. Assn. vol. i. 1878. "A Bibliography of American Laryngology."

brave man. Far from bringing bitterness and discouragement, it but served to stimulate his ambition and to quicken the energy of his intellect, as proved by the ever-recurring testimony of his history; for, with every temptation to the contrary, neither excellent social position, ample means for gratifying his luxurious tastes, nor his well-developed capacity for the enjoyment of the higher pleasures of life could divert him from his chosen calling nor quench the enthusiasm with which he followed it.

Of unusually attractive personality, Dr. Lefferts was possessed of a countenance strikingly alert, intelligent, and handsome—blonde, with features well-modeled and refined but nevertheless strong. The gentleness and cordiality of his impulses, the readiness of his sympathy, the charm of his manner, were such as to induce enduring friendships. The recollection of his mirthful pleasantries and the inimitable radiance of the smile which acclaimed them will long be treasured among the happy memories of his friends. Bright and genial in conversation, he was a welcomed companion and a charming host.

Inheriting elegant and refined tastes, he strove for perfection in all that he undertook, from faultlessness of attire and of the surroundings of his daily life to every detail of his work. One of the chiefest of his characteristics was the love of order. Everything connected with his affairs, whether professional, business, or social, was carried out with the utmost regard for system. Even the records of his routine work were models of thoroughness and elegance, set forth with consummate clearness and perfection of arrangement. With keen prevision, nothing was left to chance. His watchword was "preparedness." His whole life-work, was an eloquent exemplification of that idea. Of sterling integrity, he was in all things the soul of honor.

Strong and positive by nature, his decisions were quickly made and as promptly executed. His handwriting was unique in its clearness and marked individuality. He was an excellent draughtsman both with crayon and pen, and with the latter often evinced a keen sense of humor. Having distinctly artistic tastes, his judgment of art in its various departments was excellent. Fond of travel, he spent many summers abroad, one in particular in Japan at a time when fine specimens of its antique art were still obtainable. It was then that he secured the superb collection of

ancient Japanese armor which, deposited as his gift, is now one of the chief treasures of the Metropolitan Museum of Art. The dinners given by him annually to the members of his clinical staff at the old Delmonico's, now things of the past, were to us one of the important events of the year. He was a good horseman and greatly enjoyed that form of exercise. During the season there were few days which did not find him in the saddle either upon the bridle-paths of the park or in the ring of the riding club.

That he succeeded brilliantly in the work of his profession was due to no mere chance of fortune or of meretricious favor. The grace and talent that were his by fine inheritance he fully recognized, and, recognizing, used and cultivated with untiring industry and zeal, devoting them with unwavering fixedness of purpose to the special object of his life. This, his profession, he mastered in all its details and by every possible means. Clinical experience, wide reading, study, writing, teaching, travel, intimate association with the most distinguished authorities at home and abroad: these were the weapons with which he steadily fought his way to pre-eminence. Excellent as a writer, of remarkable initiative as an organizer, great as a practitioner, he himself would have wished us to believe, as in fact we do, that his highest usefulness was attained in the teaching of his beloved art. Indeed, the keynote of his philosophy was expressed in his chosen motto: "Docendo discimus"—by teaching we learn.

A gentleman by birth and breeding, his character, temperament and ability were such that in any department of effort he would have been a leader, a highly efficient man of affairs. If he could have left to the world but one legacy, the example of the lifelong courage, industry and enthusiasm with which, by all the varied means we have enumerated he strove to relieve the sufferings of humanity, would be to us a priceless example, a rich inheritance.

Dr. Lefferts was married June 11, 1891, to Miss Annie Cuyler Van Vechten, of Albany, New York, the daughter of Abraham Van Vechten, Esq., an eminent lawyer of that place.

Miss Van Vechten had attained distinction in the social life of her home and in Washington, where, during the presidency of Mr. Cleveland, she was a frequent guest of his sister, Miss Rose Elizabeth Cleveland, at the White House, and a brilliant addition to its chosen circle. Following her marriage, Mrs. Lefferts's

residence in New York City included a period of nineteen years. At the end of this time Dr. Lefferts's health began to show signs of impairment. For thirty-seven years, as student and practitioner, he had pursued continuously an arduous professional career. Never physically robust, and recognizing that the limits of his endurance seemed to have been reached, he wisely acquiesced, and withdrawing from all medical interests removed to his country seat at Katonah, in the Bedford Hills, New York. There, with Mrs. Lefferts, amid surroundings which he loved, he rested for ten peaceful years, cheered and sustained until the end by the companionship which had been the crowning happiness of his life.

Long a sufferer from cardiac angina, he died at his home September 21, 1920.

Dr. Lefferts was Fellow of the Academy of Medicine, New York; past-President (1876), New York Laryngological Society; past-President (1882), of the American Laryngological Association; past-President (1891), of the Alumni Association of the College of Physicians and Surgeons; Honorary Fellow of the Laryngological Societies of London, of Vienna and of Berlin; and a member also of the Surgical Society of New York, American Medical Association, New York State and County Medical Societies, and the University and Riding Clubs of New York.

APPENDIX

THE LEFFERTS CLINIC

A COLLECTION OF HALFTONE ILLUSTRATIONS REPRESENTING
THE TEACHING EQUIPMENT OF

GEORGE MOREWOOD LEFFERTS

A.M., M.D., M.S.

PROFESSOR OF LARYNGOLOGY AND RHINOLOGY, COLLEGE OF PHYSICIANS AND SURGEONS, NEW YORK

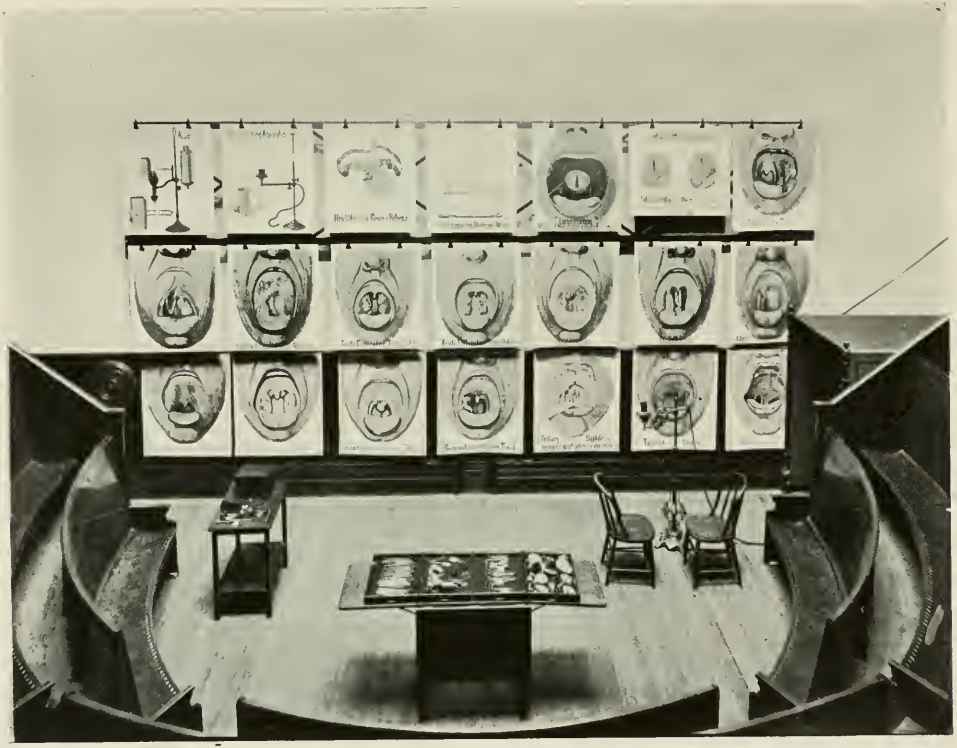
PROF. LEFFERTS

SURGEONS' ROOM, VANDERBILT CLINIC.

CABINETS FOR EXAMINATION AND TREATMENT OF PATIENTS,
VANDERBILT CLINIC.

SECTION OF THE LEFFERTS MUSEUM OF TEACHING APPARATUS
IN LARYNGOLOGY AND RHINOLOGY.

HALL OF PRACTICAL INSTRUCTION.



LECTURE NO. I.—EXAMINATION OF PHARYNX AND LARYNX.

LECTURE NO. II.—ANATOMY OF THE LARYNX. LARYNGOSCOPY.

LECTURE No. III.—ANATOMY OF NASAL PASSAGES. RHINOSCOPY.

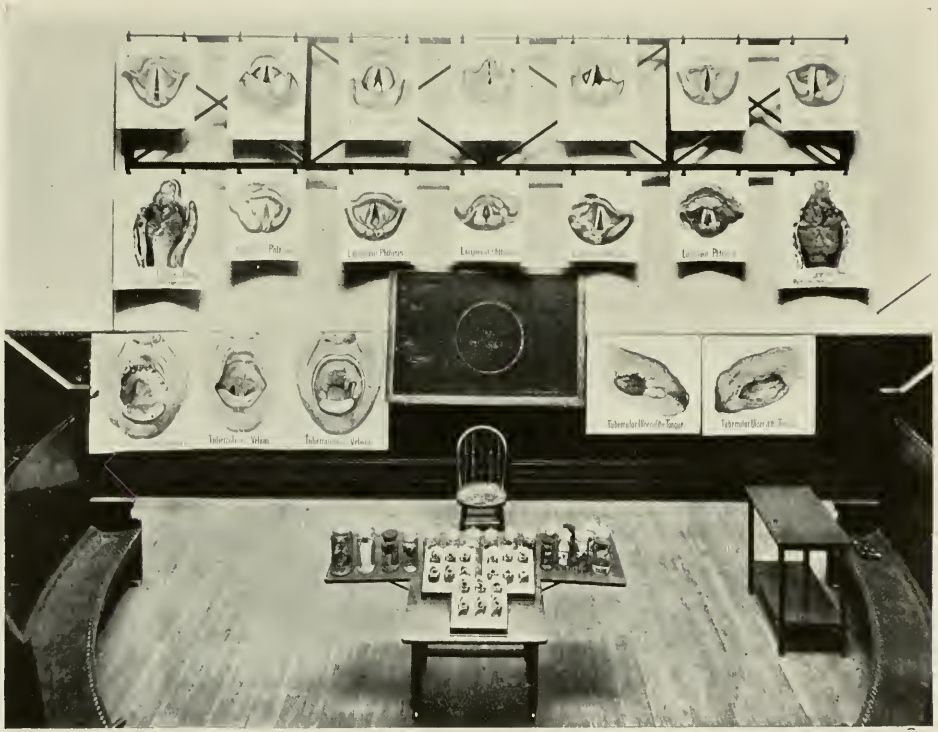
LECTURE NO. III A.—OBSTACLES TO A LARYNGOSCOPIC EXAMINATION.

LECTURE No. IV.—LARYNGEAL ANAEMIA AND HYPERAEMIA.

LECTURE No. V.—ACUTE LARYNGITIS.

LECTURE No. VI.—CHRONIC LARYNGITIS, CATARRHAL.

LECTURE No. VII.—APPARATUS FOR THE TREATMENT OF AFFECTIONS OF THE THROAT.

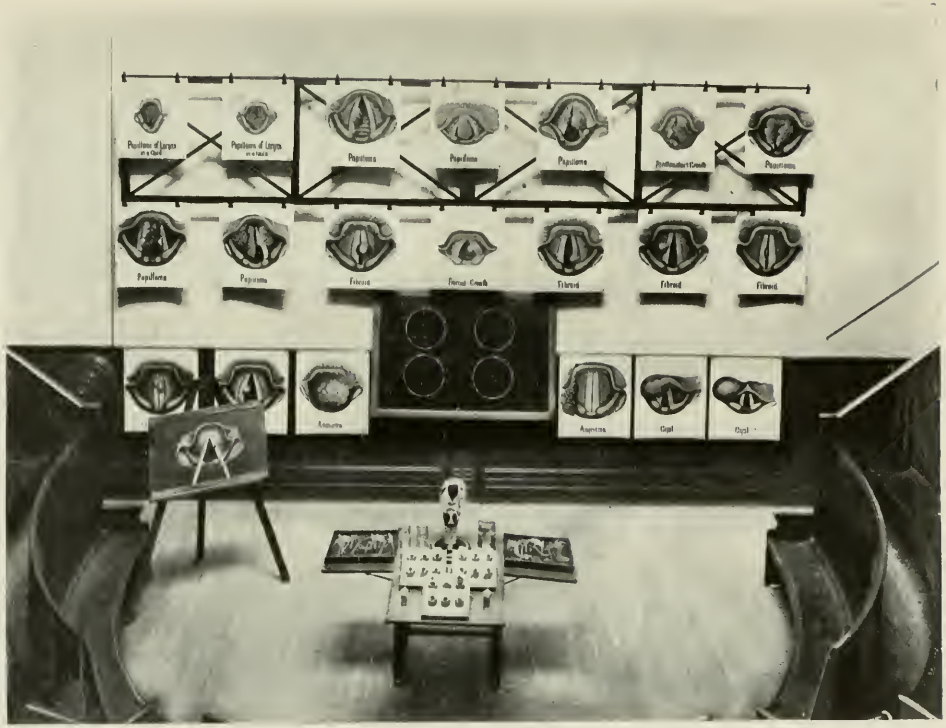


LECTURES NOS. VIII AND IX.—TUBERCULOSIS OF THE LARYNX AND PHARYNX.

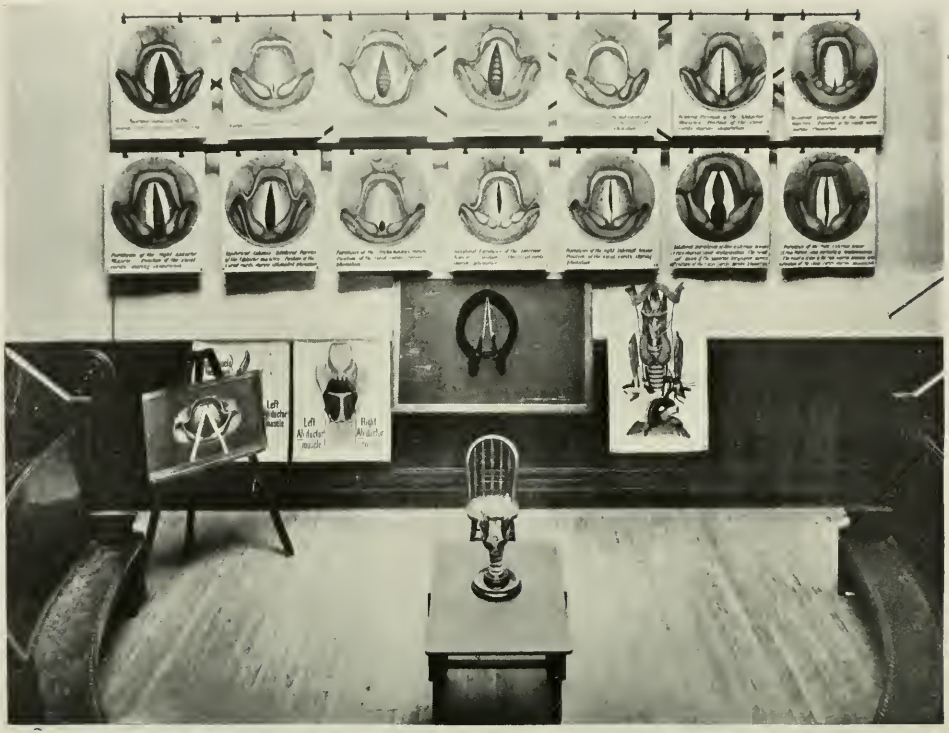
LECTURE No. X.—PRIMARY AND SECONDARY SYPHILIS.

LECTURE No. XI.—TERTIARY SYPHILIS.

LECTURE NO. XII.—MALIGNANT GROWTHS OF LARYNX AND PHARYNX.



LECTURE No. XIII.—BENIGN GROWTHS OF LARYNX.



LECTURES NOS. XIV AND XV.—LARYNGEAL PARALYSES.

LECTURE NO. XVI.—LARYNGEAL DIPHTHERIA. INTUBATION.

LECTURE No. XVII.—THE UVULA.

LECTURE NO. XVIII.—FOLLICULAR PHARYNGITIS. MYCOSIS.

Lectures Nos. XIX and XX.—TONSILLITIS.

LECTURE NO. XXI.—FOREIGN BODIES IN THE LARYNX AND PHARYNX.

THE STAFF 1896

PROFESSOR

GEORGE M. LEFFERTS

CHIEF OF CLINIC

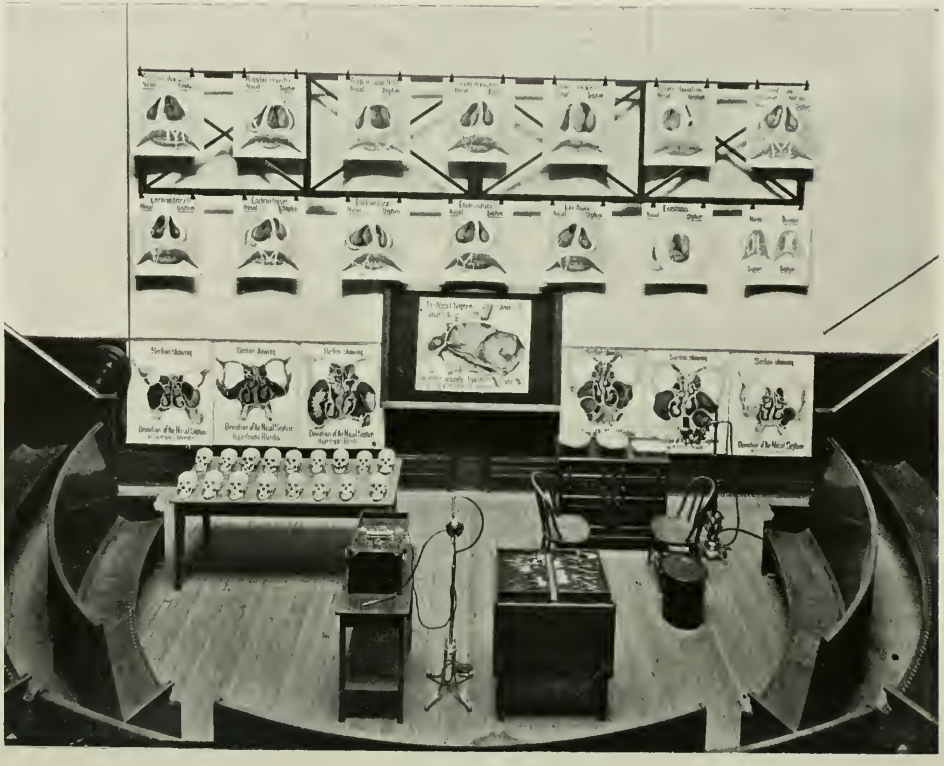
D. BRYSON DELAVAN

ASSISTANTS

L. M. HURD
R. FROTHINGHAM
W. K. SIMPSON
E. W. BILL

ASSISTANTS

C. E. VANWAGENEN
C. J. COLLES
LESURE
J. DWIGHT



LECTURE No. XXII.—ANTERIOR DEFLECTIONS OF NASAL SEPTUM.

LECTURE NO. XXIII.—ACUTE AND CHRONIC RHINITIS.

LECTURE NO. XXIV.—ATROPHIC AND HYPERTROPHIC RHINITIS.

LECTURE No. XXV.—HORIZONTAL AND CORONAL SECTIONS OF HEAD SHOWING ANATOMICAL RELATIONS OF THE NASAL SINUSES.

LECTURE No. XXVI.—NASAL POLYPS. FOREIGN BODIES.

LECTURE NO. XXVII.—HYPERTROPHIC RHINITIS. NASAL POLYPS. DEVIATIONS OF NASAL SEPTUM.

LECTURE No. XXVIII.—ADENOID HYPERTROPHY AT VAULT OF PHARYNX.

List of Fellows
1921

LIST OF FELLOWS

1921

Active Fellows

1917. Arrowsmith, Hubert, 170 Clinton Street, Brooklyn, New York.
1915. Barnes, Harry Aldrich, 305 Beacon Street, Boston, Massachusetts.
1908. Barnhill, John F., 408 Penway Building, Indianapolis, Indiana.
1904. Berens, T. Passmore, 25 Park Avenue, New York.
1921. Berry, Gordon, 10 Elm Street, Worcester, Massachusetts.
1893. Birkett, Herbert S., 252 Mountain Street, Montreal, Canada.
1891. Bryan, Joseph H., 818 17th Street, Washington, D. C.
1913. Butler, Ralph, 1926 Chestnut Street, Philadelphia, Pennsylvania.
1915. Canfield, R. Bishop, Ann Arbor, Michigan.
1917. Chamberlin, William B., Osborn Building, Cleveland, Ohio.
1897. Clark, J. Payson, 71 Marlborough Street, Boston, Massachusetts.
1902. Coakley, Cornelius G., 53 West 56th Street, New York.
1917. Coates, George Morrison, 1811 Spruce Street, Philadelphia, Pennsylvania.
1899. Cobb, Frederick C., 11 Marlborough Street, Boston, Massachusetts.
1905. Coffin, Lewis A., 114 East 54th Street, New York.
1903. Coffin, Rockwell A., 350 Commonwealth Ave., Boston, Massachusetts.
1893. Coolidge, Algernon, Jr., 613 Beacon Street, Boston, Massachusetts.
1913. Dabney, Virginius, 1633 Connecticut Avenue, Washington, D. C.
1917. Dean, Lee Wallace, Iowa City, Iowa.
1881. Delavan, D. Bryson, 40 East 41st Street, New York.

1921. Emerson, Francis P., 520 Commonwealth Avenue, Boston, Massachusetts.
1919. Faulkner, E. Ross, 410 Park Avenue, New York.
1914. Fetterolf, George, 2047 Chestnut Street, Philadelphia, Pennsylvania.
1905. Freer, Otto T., 25 East Washington Street, Chicago, Illinois.
1879. French, Thomas R., 150 Joralemon Street, Brooklyn, New York.
1897. Frothingham, Richard, 616 Madison Avenue, New York.
1913. Goldstein, Max A., 3858 Westminster Place, St. Louis, Missouri.
1898. Goodale, Joseph L., 258 Beacon Street, Boston, Massachusetts.
1905. Grayson, Charles P., 262 South 16th Street, Philadelphia, Pennsylvania.
1906. Greene, D. Crosby, Jr., 23 Bay State Road, Boston, Massachusetts.
1917. Greene, Joseph B., Asheville, North Carolina.
1905. Halsted, Thomas H., 831 University Block, Syracuse, New York.
1896. Hardie, T. Melville, 34 Washington Street, Chicago, Illinois.
1903. Harris, Thomas J., 104 East 40th Street, New York.
1915. Hastings, Hill, 924 Trust & Savings Bldg., Los Angeles, California.
1895. Hopkins, Frederick E., 25 Harrison Avenue, Springfield, Massachusetts.
1895. Hubbard, Thomas, 515 Nicholas Building, Toledo, Ohio.
1919. Hurd, Lee Maidment, 39 East 50th Street, New York.
1920. Imperatori, Charles Johnstone, 17 East 38th Street, New York.
1904. Ingersoll, John M., 1021 Prospect Avenue, Cleveland, Ohio.
1907. Jackson, Chevalier, 128 South 10th Street, Philadelphia, Pennsylvania.
1878. Johnston, Samuel, Greenway Apartments, Baltimore, Maryland.
1918. Kenyon, Elmer L., 104 South Michigan Avenue, Chicago, Illinois.
1921. Kernan, John D., Jr., 156 East 79th Street, New York.
1894. Leland, George A., 354 Commonwealth Avenue, Boston, Massachusetts.
1914. Levy, Robert, Metropolitan Building, Denver, Colorado.

1918. Lewis, Fielding Otis, 259 South 17th Street, Philadelphia, Pennsylvania.
1911. Lockard, Lorenzo B., Metropolitan Building, Denver, Colorado.
1913. Loeb, Hanau W., 537 North Grand Avenue, St. Louis, Missouri.
1897. Logan, James E., 1208 Wyandotte Street, Kansas City, Missouri.
1919. Lynah, Henry Lowndes, 127 West 58th Street, New York.
1915. Lynch, Robert Clyde, 632 Maison Blanche Building, New Orleans, Louisiana.
1921. McCullagh, Samuel, 17 East 38th Street, New York.
1913. McKimmie, Oscar A. M., 1330 Massachusetts Avenue, N. W., Washington, D. C.
1896. MacCoy, Alexander W., Haverford Court, Haverford, Pennsylvania.
1914. Mackenty, John E., 43 West 54th Street, New York.
1883. Mackenzie, John N., 605 Washington Place, Baltimore, Maryland.
1896. Mayer, Emil, 40 East 41st Street, New York.
1904. Mosher, Harris P., 828 Beacon Street, Boston, Massachusetts.
1914. Munger, Carl E., 81 North Main Street, Waterbury, Connecticut.
1901. Myles, Robert C., 11 East 48th Street, New York.
1903. Packard, Francis R., 302 South 19th Street, Philadelphia, Pennsylvania.
1906. Pierce, Norval H., 31 Washington Street, Chicago, Illinois.
1908. Randall, B. Alexander, 1717 Locust Street, Philadelphia, Pennsylvania.
1903. Renner, W. Scott, 341 Linwood Avenue, Buffalo, New York.
1897. Rhodes, John Edwin, People's Gas Building, Chicago, Illinois.
1884. Rice, Clarence C., 123 East 19th Street, New York.
1905. Richards, George L., 124 Franklin Street, Fall River, Massachusetts.
1902. Richardson, Charles W., 1317 Connecticut Avenue, Washington, D. C.
1913. Roy, Dunbar, Grand Opera House, Atlanta, Georgia.
1921. Sauer, William E., 537 North Grand Avenue, St. Louis, Missouri.

1907. Shambaugh, George E., 122 South Michigan Boulevard, Chicago, Illinois.
1909. Shurly, Burt R., 32 Adams Avenue W., Detroit, Michigan.
1919. Skillern, Ross H., 1928 Chestnut Street, Philadelphia, Pennsylvania.
1909. Sluder, Greenfield, 3542 Washington Avenue, St. Louis, Missouri.
1908. Smith, Harmon, 44 West 49th Street, New York.
1911. Stout, George C., 1611 Walnut Street, Philadelphia, Pennsylvania.
1889. Swain, Henry L., Colonial Building, 195 Church Street, New Haven, Connecticut.
1903. Theisen, Clement F., 172 Washington Avenue, Albany, New York.
1892. Thrasher, Allen B., The Groton, 7th and Race Streets, Cincinnati, Ohio.
1892. Wagner, Henry L., 518 Sutter Street, San Francisco, California.
1892. Watson, Arthur W., 126 South 18th Street, Philadelphia, Pennsylvania.
1908. Wilson, J. Gordon, 104 South Michigan Avenue, Chicago, Illinois.
1906. Winslow, John R., The Latrobe, Charles and Reade Streets, Baltimore, Maryland.
1905. Wood, George B., 1830 Spruce Street, Philadelphia, Pennsylvania.

Honorary Fellows

1915. Bosworth, Francke H., 41 Park Avenue, New York.
1914. Cohen, J. Solis, 1833 Pine Street, Philadelphia, Pennsylvania.
1914. De La Sota Y Lastra, Ramon, 7 Calle de Torqueros, Seville, Spain.
1910. Moure, E. J., 25 Cours du Jardin Public, Bordeaux, France.
1914. Thomson, Sir St. Clair, 64 Wimpole Street, W., London, England.
1921. Wright, Jonathan, Windy Rock, Pleasantville, New York.

Corresponding Fellows

1901. Collier, Mayo, Kearsney Abbey, Kent, England.
1893. Desvernine, Carlos M., 52 Cuba Street, Havana, Cuba.

1920. Ferreri, Gherardo, University di Roma, Rome, Italy.
1901. Grant, Dundas, 18 Cavendish Square, W., London, England.
1919. Kelly, Adam Brown, 26 Blythswood Square, Glasgow, Scotland.
1921. LeMaitre, Fernand, Avenue Victor Hugo, 120 (xvi), Paris, France.
1902. Lermoyez, Marcel, 20 Rue de la Boetie, viie, Paris, France.
1897. Luc, H., 15 Rue de Chanaleilles, viie, Paris, France.
1903. McBride, P., 20 South Drive, Harrowgate, England.
1919. McKernon, James F., 62 West 52nd Street, New York.
1896. Macdonald, Grevill, 85 Harley Street, Cavendish Square, London, W., England.
1894. MacIntyre, John, 179 Bath Street, Glasgow, Scotland.
1920. MacKenzie, Dan, care of Messrs. Adlard & Son, Bartholomew Close, London, England.
1896. Mygind, Holger, 31 Havnegade, Copenhagen, Denmark.
1919. Paterson, Donald Rose, 15 St. Andrew's Crescent, Cardiff, Wales.
1919. Rogers, John, Jr., 303 East 30th Street, New York.
1894. Sajous, C. E., 2043 Walnut Street, Philadelphia, Pennsylvania.
1896. Schmiegelow, Ernest, 18 Norregade, Copenhagen, Denmark.
1903. Tilley, Herbert, 72 Harley Street, Cavendish Square, London, W., England.
1913. Turner, Logan, 27 Walker Street, Edinburgh, Scotland.
1901. Wingrave, Wyatt, 11 Devonshire Street, Portland Place, London, W., England.
1894. Wolfenden, R. Norris, The Grange, Kent, England.

Emeritus Fellows

1914. Brown, J. Price, 106 South Drive, Toronto, Canada.
1918. Farlow, John W., 127 Bay State Road, Boston, Massachusetts.
1918. Hinkel, F. Whitehall, 581 Delaware Avenue, Buffalo, New York.
1912. Lincoln, William, 210 Lennox Building, Cleveland, Ohio.
1914. Porter, William, Ocean Springs, Mississippi.
1914. Robinson, Beverly, 42 West 37th Street, New York.

PAST OFFICERS

Presidents

(Year of Election)

1879.	Louis Elsberg	1901.	J. W. Farlow
1880.	J. Solis-Cohen	1902.	J. H. Bryan
1881.	F. I. Knight	1903.	J. H. Hartman
1882.	G. M. Lefferts	1904.	C. C. Rice
1883.	F. H. Bosworth	1905.	J. W. Gleitsmann
1884.	E. L. Shurly	1906.	A. W. de Roaldes
1885.	Harrison Allen	1907.	H. S. Birkett
1886.	E. Fletcher Ingals	1908.	A. Coolidge, Jr.
1887.	R. P. Lincoln	1909.	J. E. Logan
1888.	E. C. Morgan	1910.	D. Braden Kyle
1889.	J. N. Mackenzie	1911.	James E. Newcomb
1890.	W. C. Glasgow	1912.	George A. Leland
1891.	S. W. Langmaid	1913.	Thomas Hubbard
1892.	M. J. Asch	1914.	Alexander W. MacCoy
1893.	D. B. Delavan	1915.	G. Hudson Makuen
1894.	J. O. Roe	1916.	Joseph L. Goodale
1895.	W. H. Daly	1917.	Thomas H. Halsted
1896.	C. H. Knight	1918.	Cornelius G. Coakley
1897.	T. R. French	1919.	Norval H. Pierce
1898.	W. E. Casselberry	1920.	Harris P. Mosher
1899.	Samuel Johnston	1921.	Harmon Smith
1900.	H. L. Swain		

Vice-Presidents

1879.	F. H. Davis	
1880.	W. C. Glasgow	J. O. Roe
1881.	E. L. Shurly	W. Porter
1882.	C. Seiler	E. F. Ingals
1883.	S. W. Langmaid	S. Johnston
1884.	J. H. Hartman	W. H. Daly
1885.	H. A. Johnson	G. W. Major
1886.	E. C. Morgan	J. N. Mackenzie
1887.	J. N. Mackenzie	S. W. Langmaid
1888.	W. C. Glasgow	C. E. Sajous
1889.	E. Holden	C. E. Bean
1890.	J. O. Roe	J. H. Hartman
1891.	M. J. Asch	S. Johnston
1892.	S. Johnston	J. C. Mulhall
1893.	J. C. Mulhall	W. E. Casselberry

1894.	C. C. Rice	S. H. Chapman
1895.	J. Wright	A. W. de Roaldes
1896.	T. M. Murray	D. N. Rankin
1897.	A. W. MacCoy	H. S. Birkett
1898.	J. W. Farlow	F. W. Hinkel
1899.	T. A. DeBlois	M. R. Brown
1900.	H. L. Wagner	A. A. Bliss
1901.	J. W. Gleitsmann	D. Braden Kyle
1902.	G. A. Leland	T. Melville Hardie
1903.	J. H. Lowman	W. Peyre Porcher
1904.	Thomas Hubbard	W. J. Freeman
1905.	J. L. Goodale	C. W. Richardson
1906.	G. H. Makuen	A. B. Thrasher
1907.	J. P. Clark	J. E. Rhodes
1908.	E. Mayer	F. R. Packard
1909.	C. G. Coakley	H. P. Mosher
1910.	Robert C. Myles	J. M. Ingersoll
1911.	F. C. Cobb	B. R. Shurly
1912.	A. W. Watson	W. Scott Renner
1913.	F. E. Hopkins	Geo. E. Shambaugh
1914.	Clement F. Thiesen	Lewis A. Coffin
1915.	J. Gordon Wilson	Christian R. Holmes
1916.	Thomas H. Halsted	Greenfield Sluder
1917.	John Edwin Rhodes	D. Crosby Greene
1918.	G. E. Shambaugh	John R. Winslow
1919.	Francis R. Packard	Harmon Smith
1920.	Harmon Smith	W. B. Chamberlin
1921.	Dunbar Roy	Robert C. Lynch

Secretaries and Treasurers

1879.	G. M. Lefferts	1895.	H. L. Swain
1882.	D. B. Delavan	1900.	J. E. Newcomb
1889.	C. H. Knight	1911.	Harmon Smith

Secretaries

1912.	Harmon Smith	1918.	D. B. Delavan
1919.	J. M. Ingersoll	1920.	George M. Coates

Treasurer

1912. J. Payson Clark

Librarians

1879.	F. H. Bosworth	1903.	J. H. Bryan
1883.	T. R. French		

PAST MEMBERS

**Deceased*

Honorary Fellows

*1893. de Roaldes, Arthur, New Orleans, La.
*1880. Garcia, Senor Manuel, London. England.
*1914. Lefferts, George Morewood, Katona, N. Y.
*1883. Mackenzie, Sir Morell, London, England.
*1910. Massei, Ferdinand, Naples, Italy.
*1879. Oliver, H. K., Boston, Mass.
*1909. Semon, Sir Felix Great Missenden, England.
*1914. Wagner, Clinton, New York City.

Corresponding Fellows

*1892. Browne, Lennox, London, England.
*1887. Gouguenheim, A., Paris, France.
*1894. Holden, Edgar, Newark, N. J.
*1881. Labus, Carlo, Milan, Italy.
*1880. Meyer, Wilhelm. Copenhagen, Denmark.
*1881. Thornton, Pugin, London, England.
*1880. Whistler, W. McNeil, London, England.

Emeritus Fellows

1914. Brown, J. Price, Cranbrook Lodge, Wycombe, Ontario, Canada.
*1914. DeBlois, Thomas Amory, Boston, Mass.
1892. Farlow, John W., Boston. Mass.
*1914. Gleitsmann, Joseph W., New York City.
1888. Hinkel, F. Whitehill, Buffalo, N. Y.
*1912. Knight, Charles H., New York City.
1912. Lincoln, William, Cleveland, Ohio.
1914. Porter, William, Ocean Springs, Miss.
1914. Robinson, Beverley, New York City.

Active Fellows

*1880. Allen, Harrison, Philadelphia, Pa.
*1878. Asch, Morris J., New York.
*1880. Bean, C. E., St. Paul, Minn.
*1893. Bliss, Arthur Ames, Philadelphia, Pa.
*1895. Boylan, J. E., Cincinnati. Ohio.
*1892. Brown, Moreau R., Chicago, Ill.
*1889. Casselberry, William E., Chicago, Ill.
*1883. Chamberlain, C. W., Hartford, Conn.
*1896. Chappell, W. F., New York.
*1882. Chapman, S. Hartwell, New Haven, Conn.
1918. Cox, Gerard H. New York.
1880. Cushing, E. W., Boston, Mass.
*1878. Cutter, Ephraim, West Falmouth, Mass.
*1880. Daly, W. H., Pittsburgh, Pa.
*1878. Davis, F. H., Chicago, Ill.
*1901. Dickerman, E. T., Chicago, Ill.
*1878. Donaldson. Frank, Baltimore, Md.
*1901. Freeman, Walter J. Philadelphia, Pa.
*1917. Friedberg, Stanton A., Chicago, Ill.
1901. Getchell, Albert C., Worcester, Mass.
*1907. Gibb, Joseph S., Philadelphia, Pa.
*1878. Glasgow, William Carr, St. Louis, Mo.
*1878. Hartman, Jacob H., Baltimore, Md.
*1879. Holden, Edgar, Newark, N. J.
*1907. Holmes, Christian R., Cincinnati, Ohio.
*1882. Hooper, Franklin H., Boston, Mass.
1893. Hope, George B., New York City.
*1901. Hyatt, Frank, Washington, D. C.
*1882. Ives, Frank L., New York City.
*1878. Ingals, E. Fletcher, Chicago, Ill.
*1880. Jarvis, William C., New York City.
*1878. Johnson, Hosmer A., Chicago, Ill.
*1879. Johnson, Woolsey, New York City.
*1879. Kealhofer, R. H., St. Louis, Mo.
*1901. King. Gordon, New Orleans, La.
*1885. Knight, Charles H., New York City.
*1878. Knight, Frederick Irving, Boston, Mass.
*1898. Kyle, D. Braden, Philadelphia, Pa.
*1880. Langmaid, Samuel W., Boston, Mass.
*1878. Lincoln, Rufus P., New York City.

*1888. Lowman, John H., Cleveland, Ohio.
*1898. Makuen, G. Hudson, Philadelphia, Pa.
*1881. Major, G. W., Montreal, Canada.
*1879. McBurney, Charles, New York City.
*1885. McSherry, H. Clinton, Baltimore, Md.
*1881. Morgan. E. C., Washington, D. C.
*1886. Mulhall, J. C., St. Louis, Mo.
1892. Murray, T. Morris, Washington, D. C.
*1881. Mynter, H., Buffalo, N. Y.
*1893. Newcomb, James E., New York City.
*1895. Nichols, J. E. H., New York City.
1894. Park, William H., New York City.
1892. Porcher, W. Peyre, Charleston, S. C.
*1880. Rankin, D. N., Allegheny, Pa.
*1879. Roe, John O., Rochester. N. Y.
1881. Robertson, J. M., Detroit, Mich.
*1878. Rumbold, T. F., St. Louis, Mo.
*1879. Seiler, Carl, Philadelphia, Pa.
*1893. Shields, Charles M., Richmond, Va.
*1878. Shurley, E. L., Detroit, Mich.
*1879. Smith, Andrew H., Geneva, N. Y.
*1892. Simpson, William Kelly, New York City.
*1879. Tauber. Bernhard, Cincinnati, Ohio.
*1899. Thorner, Max, Cincinnati, Ohio.
*1888. Van der Poel, S. O., New York City.
1896. Ward, Marshall R.. Pittsburgh, Pa.
1879. Ward, Whitfield, New York City.
*1886. Westbrook, Benjamin F., Brooklyn, N. Y.
1896. Woolen, Green V., Indianapolis, Ind.
1890. Wright, Jonathan, Pleasantville, N. Y.

Executive Sessions
1921

EXECUTIVE SESSION

MONDAY, MAY 30, 1921

The President, Dr. Harris P. Mosher in the chair.

Dr. Jonathan Wright, of New York City, was elected to Honorary Fellowship in the Association.

Dr. Fernand LeMaitre, Paris, France, was elected to Corresponding Fellowship in the Association.

The following were elected to Active Fellowship:

Dr. Samuel McCullagh, New York City.
Dr. John D. Kernan, Jr., New York City.
Dr. William E. Sauer, St. Louis, Mo.
Dr. Francis P. Emerson, Boston, Mass.
Dr. Gordon Berry, Worcester, Mass.

The President appointed as the Auditing Committee, Dr. Harmon Smith and Dr. Robert C. Lynch.

The following Nominating Committee was elected by the Fellows of the Association:

Dr. Henry L. Swain
Dr. D. Bryson Delavan
Dr. Cornelius G. Coakley
Dr. Ross H. Skillern
Dr. Robert C. Lynch

ANNUAL BUSINESS MEETING

Tuesday, May 31, 1921

Report of the Secretary

The Secretary reports that the last annual meeting of the Association was held most successfully at Boston, May 27, 28 and 29, 1920, with a total registration of forty-six Fellows. Sixteen papers were read and discussed.

Since the beginning of that meeting, the Association has lost by death, Dr. Stanton A. Friedberg and Dr. Walter J. Freeman, Active Fellows; Dr. George M. Lefferts and Sir Felix Semon, Honorary Fellows.

Dr. Gerard H. Cox, Dr. Jonathan Wright and Dr. George B. Hope have resigned from Active Fellowship, which reduces the Active Fellowship to eighty. The addition of the five new Fellows elected at the present meeting makes a total of eighty-five Active Fellows on the list today.

ANNUAL MEETING OF THE COUNCIL

New York City, January 15, 1921

Dr. Harris P. Mosher presided and there were present besides, Drs. Pierce, Coakley, Smith, Chamberlin, Bryan, Clark, Goodale and Coates.

The Hotel Chelsea, Atlantic City, N. J., was selected as headquarters for the Annual Congress of the Association on May 30, 31 and June 1, 1921.

The Council recommended for Corresponding Fellowship, Major Fernand Le Maitre, Paris, France, and for Active Fellowship:

Dr. Samuel McCullagh, New York City.
Dr. John Devereux Kernan, Jr., New York City.
Dr. William Emil Sauer, St. Louis, Mo.
Dr. Francis P. Emerson, Boston, Mass.
Dr. Gordon Berry, Worchester, Mass.

A Committee on Publication, to consist of the President, the Treasurer and the Secretary, was appointed to decide questions arising during the course of printing the *Transactions* and to consider a plan for disposing of the back numbers. The Council urged all members to complete their sets of *Transactions* by purchasing from the Treasurer such back volumes as are in stock.

As there will be a serious deficit in the funds of the Association this year, the Council recommends to the Association that the Annual Dues of Active Fellows be increased to $25 until such time as conditions warrant their reduction.

Dr. Joseph H. Bryan was appointed to act as a Committee on Arrangements for the annual meeting of the Association in connection with the Congress of Physicians and Surgeons in Washington in 1922.

Dr. Emil Mayer was reappointed Abstract Editor for the coming year, subject to the approval of the Association.

The Council announced with sorrow the death of Dr. George M. Lefferts, Honorary Fellow, in Katona, N. Y., on September 25, 1920; and of Dr. Walter J. Freeman, Active Fellow, in Philadelphia on December 20, 1920.

SECOND MEETING OF COUNCIL

Atlantic City, N. J., May 29, 1921

The Second meeting of the Council, was held at the Hotel Chelsea, May 29, 1921, all the members of the Council being present. The following recommendations to the Association were passed:

1. That the resignations of Dr. Gerard H. Cox, Dr. Jonathan Wright and Dr. George B. Hope be accepted with regret.
2. That $50 be appropriated for the expenses of the Abstract Editor.
3. That past volumes of the Transactions be offered to all Fellows at the price of $1 per volume.
4. That the Association nominate as its representatives on the Board of Governors of the American College of Surgeons for the term expiring 1924, Drs. Goodale, Ingersoll and Roy.

The 1922 meeting of the Association will be held in Washington, May 1, 2 and 3 in connection with the triennial meeting of the Congress of Physicians and Surgeons.

George M. Coates,
Secretary.

The report of the Secretary was accepted and ordered placed on file.

The Auditing Committee having reported the Treasurer's Account to be correct, the Report of the Treasurer was accepted and ordered to be placed on file.

TREASURER'S STATEMENT TO MAY 15, 1921

Receipts

Balance from old account	$962.97
Dues (1920) collected	75.00
Extra assessment (83 Fellows)	830.15
Dues (1921) collected (82 Fellows)	1231.53
Registration Fees, 1919 Congress (18 Fellows)	90.00
Sale of Transactions	60.80
Interest on deposits	23.18
Advanced by a member of the Council	1489.00
	$4762.63

Expenses

J. M. Ingersoll, Secretary	$134.93
Stenographer, 1920 Meeting	151.12
1919 Congress of Physicians and Surgeons	90.00
Secretary, 1920-1921	300.00
Abstract Editor	50.00
Packing and Express on *Transactions* from New York	38.72
Transactions, 1919	2549.00
Transactions, 1920	940.71
Treasurer's Expenses	29.49
Collecting Canadian Checks	3.81
Commission, Chicago Medical Book Co.	1.20
Balance in Bank	473.65
	$4762.63

ASSETS OF THE ASSOCIATION

Invested

De Roaldes Prize Fund	$500.00	
Accrued interest to February 1, 1921	157.47	
		$657.47
Casselberry Legacy	$5000.00	
Accrued interest to February 1, 1921	809.88	
		5809.88

Current

Unpaid dues	$15.00	
Bank Balance	473.65	
		488.65
Total assets		$6956.00
Liabilities, loan		$1489.00

Respectfully submitted,

J. Payson Clark,
Treasurer.

Audited and approved:
Harmon Smith,
R. C. Lynch,

Report of the Librarian

The Librarian, Dr. Joseph H. Bryan, reported that there had been no additions to the Library during the current year, but that there were some reprints in the hands of the Secretary which will be accounted for at the next annual meeting.

The report of Dr. Emil Mayer, Abstract Editor, was read and ordered to be placed on file.

Report of the Abstract Editor

In accordance with the usual method, all original papers read in the Session for 1920 were abstracted by the authors or by the Abstract Editor.

The stenographer's copy of discussions was received on June 20, and on June 23 abstracts of the discussions, sixty in all, were mailed to twenty-seven members of the Association. All but four of these were returned corrected by the speakers within a comparatively short time. The four above-mentioned still have them.

The completed abstracted proceedings were sent to the Editor of the *Annals of Otology* and galley proofs were returned by him on August 7. On August 14, these galley proofs were forwarded to the usual journals for publication.

Emil Mayer,
Abstract Editor.

Following the reading of this report, Dr. Mayer stated that it has not been the custom for the last six years to have the official abstract of the discussions printed in other than special journals. On the contrary, the articles have been printed in journals relating to branches closely allied to our specialty, and the general profession, therefore, is not in touch with the important work done by this Association. The number of these abstracts sent out this last year has been less than heretofore, owing to the high cost of paper and labor. Dr. Mayer then moved that the abstract editor be authorized to make arrangements with one journal, not a special one, to print reports in addition to the official special

journal, the *Annals of Otology, Rhinology and Laryngology*. The Editor in addition would wish to supply a few copies for foreign countries only. This motion was seconded and carried. A motion to accept the report of the Abstract Editor was carried with a vote of thanks to Dr. Mayer from the Association for his splendid and painstaking work. Dr. Mayer then requested that the Abstract Editor be permitted to select from among the younger members of the Society, an assistant to help him in the work and to be trained for the future. This was put in the form of a motion and was carried.

Dr. Delavan reported for the DeRoaldes Prize Fund Committee that the prize will be offered for competition next year and exhibited a model of the medal which is given in connection with the prize.

Report of the Committee on Control of Cancer

The report of the Committee on the Control of Cancer was read by Dr. Delavan as follows:

Under the able Chairmanship of Dr. Charles A. Powers, the progress made by this Society during the past year has been remarkable. Considerable additions have been made to the membership, although greater numbers are desired. The organization of the country for intensive cancer-control work has practically been completed. There are now nine regional districts, made up of from two to five states, each under the direction of an eminent and interested physician or surgeon. Thirty-three states, exclusive of Hawaii, are also organized with chairmen, and reports from them plainly show that the work is well under way.

A cancer exhibit has been prepared under the hands of an eminent New York illustrator and a set of fourteen sketches in color, drawn by him, designed to show the essentials of the cancer problem from the standpoint of the layman.

The past year has seen a vastly increased number of lectures by the Society and persons affiliated with it. In New York City, 45 lectures were given to a total attendance of about 4000 people; while in the state of Colorado, 84 lectures with an attendance of over 5000, have been held. Many other lectures have been given by local and

state committees. Excellent coöperation has been rendered in this connection by the American College of Surgeons, while successful "cancer weeks" have been carried out during the past year in New York City, Ohio and Colorado. Over 90,000 pieces of literature were distributed during the year. Circular letters were sent out to 149 medical journals, enclosing the more important publications of the Society. Many of these journals carried news or editorials based on this material. A new handbook for the lay reader was printed and widely circulated and many other activities were entered upon and successfully accomplished.

The usefulness of the Society is becoming more and more appparent and its generous support increasingly and emphatically justified.

D. Bryson Delavan,
Chairman.

The report of the Committee for the Casselberry Prize Fund was read by Dr. Norval H. Pierce, chairman. He stated that there is about $500 now available for this fund, which can be used, according to his interpretation, for paying the expense of original investigation and research or for a medal or prize, and is not limited to members of this Association. There is no work submitted for this fund so far.

Dr. Greenfield Sluder presented a report of the Candidates' Nominating Committee. The Committee proposed thirteen names for either full or associate membership and stated that application blanks will be made out in proper form.

Report of Committee on Tonsil Investigation

The report of the Committee on Tonsil Investigation was presented by its chairman, Dr. George L. Richards, as follows:

This Committee was appointed some years ago for the purpose of careful study of the embryology, physiology and pathology of the tonsil and its relation to the general bodily economy in health and disease. The plan of procedure was formed after conference with Dr. Jonathan Wright and had as one of its items the employment of a research worker under Dr. Wright's direction.

An unsuccessful attempt to obtain funds from members for this project resulted in a change of plan. The new plan was to gather

together the individual studies and observations of members and others, then to correlate these and eventually publish a monograph which might be reasonably correct and represent the best views on all phases of this question as of the date of publication. Coming from this Association, it was felt that such a publication might be of some authority and influence.

Before anything worth while had been accomplished the war came, and in the period since then the chairman has been continuously engaged in post-war activities to such an extent that he has given no time to this work, a confession he regrets to have to make. It cannot, however, be said that no progress has been made, although but little has been done along the lines as laid out by the committee. In the carefully prepared papers of Dr. Delavan and Dr. Hastings, which were read to us yesterday, we have made a beginning. It is especially desired that we have careful, studied papers and observations like those of Dr. Hastings. We want from all of you careful studies of specific points and covering a sufficient length of time to make such observations of worth. These should be clinical, histological and pathological. If this is done the time will come when we can put out something worth while and worthy of this Association. What is a normal, what is a diseased, tonsil? Dr. Swain and others are trying to find out and to apply the appropriate remedy, whether it be slitting the crypts or finding out the proper diet or whatever else may be the proper remedy. Today patients arrive at our offices with what is virtually an order from the internist or the orthopedist or other specialists to remove their tonsils, and if we hesitate and ask for time to determine whether it is really necessary, or wonder whether the procedure will really accomplish all that is desired, we are in the position of "He who hesitates is lost." For the patient will seek some other more willing and less conscientious physician, since the orders were to have the tonsils removed, and you may be sure that that is what is going to be done.

Our out-patient clinics are crowded with children. Are they there for manifest trouble? No; but because the school doctor, the district nurse, the family doctor or a friend has sent them to have their tonsils out. And with instruments, wonderful in their mechanical ingenuity, but often used by unskilled hands, the delicate structures of the child's throat are attacked, with results which would be disastrous did not nature early attempt to establish in the throat an immunity through the very gland whose slaughter is to take place. I do not expect that an Association like ours can stem such a tide of tonsil destruction as is now overwhelming this country, but I do think

we should try. Until we get somewhere near normalcy but little can be accomplished except in the way of gathering information. Such being the case, it would seem best that this committee be continued for the present at least.

The report was accepted and the Committee continued. The Chair appointed Dr. Hill Hastings a member of this Committee to take the place of Dr. Jonathan Wright, resigned.

The Report of the Nominating Committee

At a meeting of this Committee held May 31, 1921, a quorum being present, the following were nominated directors of the Association for the year 1921-22:

Dr. Harmon Smith, New York City.
Dr. Dunbar Roy, Atlanta, Ga.
Dr. Lee Wallace Dean, Iowa City, Iowa.
Dr. George M. Coates, Philadelphia, Pa.
Dr. J. Payson Clark, Boston, Mass.
Dr. Joseph H. Bryan, Washington, D. C.
Dr. Thomas H. Halsted, Syracuse, N. Y.
Dr. Cornelius G. Coakley, New York City.
Dr. Norval H. Pierce, Chicago. Ill.
Dr. Harris P. Mosher, Boston, Mass.

Report of the Biographer and Historian

Dr. Delavan presented the Report of the Biographer and Historian, which was accepted and ordered to be printed in full in the Transactions.

Report of Committee on Graduate Teaching of Laryngology

The Committed on Graduate Teaching of Laryngology reported through Dr. Coakley as follows:

SUMMARY

1. We recommend that students preparing for the practice of otolaryngology be graduates of Class A medical schools and have completed a year's service as intern in an approved general hospital or its equivalent.

2. We recommend that when possible the preparation for special practice be started immediately after completion of this hospital year. We do not approve of specialization beginning during the undergraduate medical course nor in the intern year.

3. We recommend that the minimum training consist of eighteen months' full-time work. The first year to be spent in one place; the last six months may be continued here or the work may be pursued in other approved centers. During the first year one-half of the time should be devoted to the clinical study of cases, the other half to the study of the fundamental sciences and to library work.

4. All of this work must be on the basis of genuine graduate instruction, in which the student does his work individually under proper supervision.

5. The work in the fundamental sciences should be done in properly equipped laboratories, such as exist in all Class A medical schools. The clinical work must be done in a properly equipped and properly organized out-patient department of either a Class A medical school or a special hospital, the student serving as clinical assistant.

6. On the completion of the first year's fundamental training the student is advised to secure, so far as this is possible, the position of intern in a special hospital or of resident in otolaryngology in a general hospital.

7. For those students who are not able to secure suitable hospital positions after the completion of the first year's fundamental training, the remaining six months' work necessary to fill out the eighteen months' minimum requirement may be taken as a continuation of the first year's work in the same institution or by taking special work in other centers. Others may devote the last six months serving as assistant in the practice of some established specialist. When the latter alternatives are followed, the work selected must meet the approval of the institution in which the first year's work has been taken.

8. We recommend that on the completion of the above requirements the student be granted a suitable certificate setting forth that he has had the proper preparation for taking up the practice of the

specialty. This certificate is to be granted by the institution in which the first year's work has been taken. We make no recommendation regarding the granting of higher degrees. We feel satisfied that such degrees will be granted as readily by the university to those students preparing for the practice of otolaryngology as to students in any other field whenever the work pursued meets the requirements established for the granting of such degrees.

9. We recommend that the student in otolaryngology devote three years, if possible, to the study of his specialty.

The committee hope to be able to assist the candidate in the following ways:

1. Securing from the graduate departments of the universities a suitable degree, to be conferred only upon such candidates as have followed the above course.

2. By correspondence with the graduate departments of the universities with a view to securing a uniformity in the course of study to be pursued.

3. By arranging with the hospitals referred to above to limit their appointments, as interns, to those candidates who have taken the above course.

4. By preparing a list of hospitals to which candidates may safely be recommended to apply for the position of intern.

5. By securing reliable information as to the facilities offered by various centers which they may place at the disposal of those who desire to perfect themselves still further in any department in otolaryngology, after the above course has been concluded.

6. A copy of these recommendations be transmitted to the Council of the American Medical Association.

7. It is recommended that the committees of the several special societies be continued in order to better advance the subject of graduate instruction in otolaryngology.

Dr. Coakley states that this Committee, four or five years ago, met with similar Committees from the American Otological Society, the American Laryngological, Rhinological and Otological Society, the American Academy of Ophthalmology and Otolaryngology and the Otolaryngological Section of the American Medical Association to outline plans for proper instruction for such graduates in medicine who wish to become properly trained in our specialty. The resolutions then adopted were forwarded to

various societies asking for coöperation, but nothing further developed. In February of this year, however, at a meeting of the Council of the American Medical Association and of the Association of the American Medical Colleges, the matter was again taken up and minimum requirements for graduate instruction for specialists in all branches of medicine were considered. The requirements for otolaryngology were presented last year, and with slight modifications that preliminary report is to be presented at the next meeting of the American Medical Association for action. That summary with certain slight modifications is contained in the above report.

Being questioned by Dr. Wood as to the meaning of one year's study, Dr. Coakley replied that it is to be an entire year, affording these men opportunity for work and seeing that the work is accomplished. A good deal of the clinical work, of course, can therefore, be carried out during the four summer months.

Dr. Swain moved that this report be accepted as being the present opinion of the Association and the best summary of requirements that can be given out at the present time. This motion was seconded and carried.

Miscellaneous Business

Dr. Mayer announced that the *New York Medical Record* had been officially designated as publisher of the abstracted proceedings of the Association, and that Dr. Charles J. Imperatori had been selected to act as Assistant Abstract Editor for the Association.

Dr. Mayer moved that the Secretary of this Association be directed to extend official congratulations and greetings to the editor of the *Laryngoscope* on the completion of the twenty-fifth year of the publication of that journal, which has done such special service to the cause of laryngology. The motion was seconded and carried.

The proposed amendments to the Constitution, introduced at

the meeting of the Association in 1920, were acted upon and adopted:

1. To amend Article 1, by inserting after the words "Honorary Fellows" the words "Associate Fellows."

2. To amend Article 3, clause 5, by adding "Associate Fellows shall not exceed twenty in number. They must be proposed and seconded by Active Fellows and elected by the Council at its Annual Meeting in January. The term of membership of each Associate Fellow shall not exceed six years from the date of his election by the Council. Associate Fellows shall have the privilege, with the approval of the Council, of making scientific contributions at the Annual Meetings of the Association and of partaking in all discussions of scientific papers but shall not have any vote or participation in the executive affairs of the Association.

"Any Associate Fellow who shall not have been nominated by the Council to the Association and elected to Active Fellowship before the termination of his period of Associate Fellowship shall thenceforth cease to be an Associate Fellow and may not again be elected an Associate Fellow."

The resignations of Drs. Jonathan Wright, George B. Hope and Gerard H. Cox were accepted with regret.

The recommendation of the Council that an appropriation of $50 be made for the expenses of the Abstract Editor was approved by the Association.

The recommendation of the Council that past volumes of the proceedings be disposed of to members only at the price of $1 per volume was adopted. The Treasurer reports that there has been an accumulation of these volumes, and it is hoped that the new members may wish to complete their sets.

Drs. J. L. Goodale, John M. Ingersoll and Dunbar Roy, were recommended by the Council for the Board of Governors of the American College of Surgeons for the term of 1921-24. They were unanimously nominated to the American College.

The Council recommend that in view of the increased expenses of the Association during the last three years, the annual dues of the members shall be increased to $25 until such time as cir-

cumstances warrant a reduction. It was moved, seconded and carried that this recommendation of the Council be adopted.

The Association endorsed the action of the Council in reappointing Dr. Emil Mayer as Abstract Editor for the ensuing year.

Owing to the fact that the amendments to the Constitution provide for twenty Associate Fellows, Dr. Coakley moved that Article VIII of the By-Laws be amended as follows: "The dues of Associate Fellows shall be $15 a year." This amendment was seconded by Dr. Bryan and carried.

EXECUTIVE SESSION

Wednesday, June 1, 1921

At the close of the Scientific Session, the Executive Session was called to order by the President, Dr. Mosher, at 12.45 P.M.

The ten Fellows selected by the Nominating Committee to be Directors of the Association for the ensuing year were thereupon unanimously elected. These Directors immediately upon their election retired to elect officers for 1921-22, and the following selections were announced: Dr. Harmon Smith, President of the Association; Dr. Dunbar Roy, First Vice-President; Dr. Lee Wallace Dean, Second Vice-President; Dr. George M. Coates, Secretary; Dr. J. Payson Clark, Treasurer; Dr. Joseph H. Bryan, Librarian; and as additional members of the Council, Drs. Thomas H. Halsted, Cornelius G. Coakley, Norval H. Pierce and Harris P. Mosher.

Dr. Delavan said that it has been the custom for many years to keep as clear a record as possible of the biographies of all the members, and also a collection of their photographs. This record should be renewed from time to time by adding to these biographies and getting later photographs of the older members. A circular letter containing a *questionnaire* will soon be sent out to each member of the Association for this purpose. Dr. Delavan considers this a very serious matter and begs that all new and old members will promptly supply the data asked for, as it is of great value in preparing memorials.

Dr. Mosher called the President-elect, Dr. Harmon Smith, to the chair and presented him with the gavel of the Association for the coming year.

Dr. Swain moved that a vote of thanks be given to the outgoing officers, particularly to the President and Secretary, for their industry and tactfulness in preparing for this meeting, the most successful and largely attended in the history of the Association.

This motion was accepted and carried, and there being no further business, the meeting adjourned.